SOIL SURVEY

KOOSKIA AREA, IDAHO

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

and Forest Service

UNITED STATES DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs

In cooperation with

UNIVERSITY OF IDAHO COLLEGE OF AGRICULTURE

Idaho Agricultural Experiment Station

Issued October 1971

Major fieldwork for this soil survey was done in the period 1954-1963. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1962. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Bureau of Indian Affairs, the University of Idaho College of Agriculture, and the Idaho Agricultural Experiment Station. It is part of the technical assistance furnished to the Idaho Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All the soils of the Kooskia Area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit, woodland group, and range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those that have a moderate limitation can be colored yellow, and those that have a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, range sites, and woodland groups.

Foresters and others can refer to the section "Use of the Soils as Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Ranchers and others can find, under "Use of the Soils for Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for recreation areas in the section "Use of Soils for Recreation."

Engineers and builders can find, under "Engineering Use of Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in the Kooskia Area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication.

Cover: Area along the Clearwater River typical of the Klicker-Gwin-Mehlhorn soil association in the Kooskia Area. The steep Gwin and Mehlhorn soils on the grassy south-facing slopes are used mostly for range, and the steep Klicker soil on the wooded north-facing slopes is used mostly for timber. Mixed alluvial land along the river is suited to recreational sites.

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SOIL SURVEY OF THE KOOSKIA AREA, IDAHO

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, AND UNITED STATES DEPARTMENT OF INTERIOR, BUREAU OF INDIAN AFFAIRS, IN COOPERATION WITH UNIVERSITY OF IDAHO COLLEGE OF AGRICULTURE, IDAHO AGRICULTURAL EXPERIMENT STATION

THE KOOSKIA AREA is in the northwestern part of Idaho County (fig. 1). It has a total of about

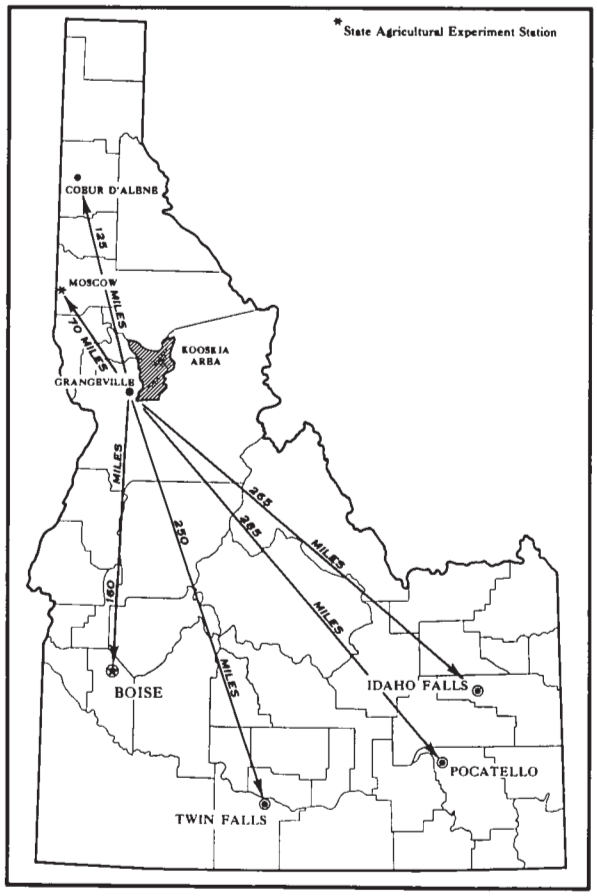

Figure 1.--Location of the Kooskia Area in Idaho.

316,360 acres or nearly 495 square miles. Much of the survey area is in trees.

The survey area is bounded on the west by the Clearwater River and the South Fork Clearwater River, except for the central part of the boundary line where 3,200 acres are west of the South Fork Clearwater River. Lolo Creek forms the northern boundary, except for a small area near Musselshell Ranger Station. On the east the Area is bounded chiefly by the divide that extends north and south of the junction of the Lochsa and Selway Rivers. The southern boundary is the line between T. 29 N. and T. 30 N.

The survey area is made up of strongly dissected plateaus and low mountains. The western part of the Area is part of the eastern extension of the Walla Walla section of the Columbia Plateau. Here the plateau has been strongly and deeply dissected by the Clearwater, the Middle Fork Clearwater, and the South Fork Clearwater Rivers and by Lolo Creek and by the tributaries of these streams. These streams and their tributaries are 1,500 to 2,300 feet below the general level of the plateau. Some broad undulating or rolling remnants of the plateau remain at an elevation of 2,700 to 3,500 feet. Most of the cropland is on these remnants. In the northwest corner of the survey area, the Clearwater River is at an elevation of about 1,100 feet. The elevation at the town of Kooskia is 1,260 feet.

Near the middle eastern and western parts of the survey area the plateau grades eastward into the lower parts of the northern Rocky Mountains. This region consists of folded, rounded ridges and mountains that have been deeply dissected by tributaries of the Clearwater River. The ridges and mountains rise to an elevation of 4,500 to 5,700 feet, or higher, near the eastern boundary of the survey area.

Most of the survey area was forested before settlement. In the western part of the Area, many of the slopes that face south and west had a cover of grasses, forbs, and shrubs. About 45,000 acres now are in crops; about 69,000 are in range and pasture; and the remaining 202,360 acres are used as woodland.

The chief enterprise in the survey area is the growing of timber for forest products. Other sources of income are cattle raising, general farming, and recreation. About 318 farms are in the survey area.

The population of the survey area is sparse. Most of the people live in areas along the rivers. Kooskia, the largest town in the survey area, has a population of about 800. The population of Stites is about 300, and that of Clearwater is about 40.

Because of differences in slope, climate, natural vegetation, and parent material, the soils vary greatly throughout the survey area. Many of the soils are well suited to trees, but few of them are well suited to cultivated trees.

[1] Charles F. Swenson, Soil Conservation Service, and W. Janssen and R. C. McConnell, Forest Service, assisted in the field survey.

HOW THIS SURVEY WAS MADE

Soil scientists made this survey to learn what kinds of soils are in the Kooskia Area, where they are located, and how they can be used. The soil scientists went into the Area knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the Area, they observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series and the soil phase are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Kooskia and Greencreek, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Kooskia silt loam, 7 to 12 percent slopes, is one of several phases within the Kooskia series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Soil complexes are such kinds of mapping units shown on the soil map of the Kooskia Area.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils joined by a hyphen. Gwin-Klicker stony loams, 40 to 65 percent slopes, is an example.

In most areas surveyed there are places where the soil is so rocky, so shallow, or so severely eroded that it is not practical to classify it by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rock land is a land type in the Kooskia Area.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

GENERAL SOIL MAP

The general soil map at the back of this survey shows, in color, the soil associations in the Kooskia Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an Area, who want to compare different parts of an Area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in the Kooskia Area are discussed in the following pages.

1. Kooskia-Caribel Association

Deep and very deep, nearly level to steep soils that have a surface layer of silt loam and a subsoil of silt loam to silty clay; on broad ridgetops

This soil association is in the western half of the Area. It consists of nearly level to steep soils on broad ridgetops and on remnants of a high, deeply dissected plateau or plain (pl. I). Elevation ranges from about 2,000 to 3,400 feet. Average annual precipitation ranges from 24 to 30 inches. The average annual temperature is about 48° F., and the frost-free season ranges from 90 to 130 days. The native vegetation was mostly ponderosa pine and Douglas-fir.

Most soils of this association formed in windlaid silty material underlain by material weathered from basalt. Some of the soils, however, formed in material weathered mostly from basalt or from acidic igneous or metamorphic rocks.

This association occupies about 18 percent of the Area. Kooskia soils make up about 67 percent of the acreage, Caribel soils about 25 percent, and minor soils the remaining 8 percent.

Kooskia soils are deep and very deep and are moderately well drained. The surface layer is dark grayish-brown silt loam and the subsoil is brown or pale-brown silt loam, silty clay loam, and silty clay.

The Caribel soils in this association are near the community of Caribel. They are deep and very deep and are well drained. Their surface layer is reddish-brown silt loam, and their subsoil is mostly reddish-brown silt loam or silty clay loam that is underlain by basalt.

Minor soils in this association are the Gwin, Klicker, Mehlhorn, and Weedmark and small areas of somewhat poorly drained soils at the heads of small canyons. The Gwin, Klicker, and Mehlhorn soils are steep and are on canyon slopes. Gwin soils are on grassy, south-facing slopes, and Klicker soils are on wooded north-facing slopes. Weedmark soils, on granite or gneiss, occupy small areas near the town of Woodland.

The soils of this association are used for crops, timber, and grazing. Most of the crops produced in the Area are grown on the Kooskia and Caribel soils in this association. Small grains, peas, hay, and pasture grow well on these soils. Wheat is the main cash crop. The farms vary considerably in size, but their average size is about 330 acres.

Because of a perched water table and the susceptibility of the soils to frost heaving, roads are difficult to maintain on soils of this association. During wet weather unsurfaced roads become soft and impassable. Roads have been built on most of the ridges and in some of the canyons, and many of them have a gravel surface. Suitable sites for ponds are present in much of the association. The topography is favorable for recreational sites. The soils in this association provide year-round habitat for deer.

2. Lochsa-Yakus Association

Very deep to shallow, moderately steep to very steep soils that are coarse sandy loam or loam throughout; on canyon sides

Soils in this association are moderately steep to very steep. They are on the sides of canyons along Lolo Creek and the Clearwater River in the northwestern part of the Area, along the Middle Fork Clearwater River in the central part of the Area, and adjacent to the South Fork Clearwater River and Lightning Creek in the southwestern part of the Area. Elevation ranges from about 1,100 to 4,000 feet. Average annual precipitation ranges from 21 to 36 inches. The average annual temperature ranges from 48° to 50° F., and the frost-free season ranges from 100 to 165 days. The vegetation consists mostly of trees, but grasses, forbs, and shrubs grow in some areas.

Most soils in this association formed in material weathered from granite, gneiss, mica-schist, or similar coarse-grained, acidic igneous or metamorphic rocks.

This association occupies about 7 percent of the Area. About 65 percent consists of Lochsa soils, 30 percent of Yakus soils, and the remaining 5 percent of minor soils.

Lochsa soils have a thick, dark grayish-brown to brown sandy loam surface layer and a brown, gravelly

to cobbly coarse sandy loam subsoil. They are somewhat excessively drained. Most areas are on moist northern slopes, but some are on the drier southern slopes. The trees on the northern slopes are predominantly grand fir and Douglas-fir, though western redcedar and western white pine grow in some places. On the southern slopes the trees are predominantly ponderosa pine with some Douglas-fir.

The shallow Yakus soils have a surface layer of dark grayish-brown loam and a subsoil of brown gravelly loam. They are well drained. They are on slopes that face south and have a cover of grasses and forbs.

Minor soils in this association are the Weedmark and Suttler and small areas of soils on alluvial fans and bottoms. Weedmark soils are on ridgetops, and Suttler soils are in more moist sites. These minor soils generally are not so steep as the Lochsa and Yakus soils.

Most of the soils in this association are too steep for crops. The soils are used mainly for producing timber and for grazing by livestock and big game. The farms and ranches are large, and the farmsteads are along rivers where small acreages of bottom lands or alluvial fans are suitable for crops and gardens.

The building of roads and of recreational areas in this association are hindered by steep slopes. Roads can be built satisfactorily, however, on the contour. The soils generally are too steep to be used as sites for ponds. This association provides year-round habitat for deer.

3. Suttler Association

Deep, rolling to very steep soils that are dominantly loam throughout; on uplands

This soil association consists of deep, sloping to very steep soils on uplands (pl. I), mainly in the southern and eastern parts of the Area. Elevation ranges from 2,500 to 5,000 feet. Average annual precipitation ranges from 30 to 40 inches. The average annual temperature is about 40° F., and the frost-free season ranges from 70 to 100 days.

These soils formed in material weathered from mica-schist, gneiss, granite, and other acidic igneous and metamorphic rocks. Rocks crop out in a few places.

This association occupies 20 percent of the Area. Suttler soils make up 85 percent of the acreage, and the remaining 15 percent is minor soils.

Suttler soils are well drained. They have a thin organic layer, a thin grayish-brown loam surface layer, and a brown and light yellowish-brown loam and fine sandy loam subsoil.

Minor soils in this association are the Colville, noncalcareous variant and the Greencreek, Jughandle, and Potlatch. Jughandle soils, which make up about 10 percent of the association, are deep or very deep. They have a thin organic layer underlain by brown and light yellowish-brown sandy loam. Below is pale-brown and very pale-brown coarse sandy loam and gravelly loamy coarse sand. The Colville, Greencreek, and Potlatch soils border Meadow Creek in the extreme southern part of the Area. These soils formed from alluvium and colluvium or in material weathered from rock. They have a clay loam to clay subsoil. Greencreek soils are rolling to hilly. Potlatch soils are in swales and in seepage areas, and Colville soils are on bottom lands and alluvial fans.

This association is used mainly for producing timber and for limited grazing. Trees grow well. The dominant trees on the Suttler and Jughandle soils are grand fir, western redcedar, and Douglas-fir, but ponderosa pine and western white pine grow in a few places. Only a few areas are used for farming.

Lack of soil stability in subgrades, cutbanks, and fill slopes hinders construction of roads in this association. The soft rock underlying the Suttler soils is easily ripped and bladed by heavy machinery. In many places the topography is not suitable for recreational sites. The soils of this association provide year-round habitat for wildlife.

4. Jughandle Association

Deep or very deep, hilly to very steep soils that are dominantly sandy loam throughout; on uplands

This soil association consists of deep or very deep, hilly to very steep soils. These soils are mainly in the eastern part of the Area, where elevation ranges from 3,300 to 6,000 feet. Average annual precipitation ranges from 30 to 42 inches. The average annual temperature is 40° F., and the frost-free season ranges from 10 to 80 days. The native vegetation was mainly grand fir, western redcedar, western white pine, western larch, Douglas-fir, and associated plants.

These soils formed chiefly in material weathered from granite, quartz monzonite, gneiss, mica-schist, and other similar coarse-grained, acidic igneous and metamorphic rocks.

This association occupies about 18 percent of the Area. Jughandle soils make up about 90 percent of the association, and the remaining 10 percent consists of minor soils.

The Jughandle soils are deep or very deep and are somewhat excessively drained. They have a thin organic layer underlain by brown and light yellowish-brown sandy loam. Below is pale-brown to very pale brown coarse sandy loam and gravelly loamy coarse sand.

Minor soils in this association are the Helmer, Molly, and Suttler. Helmer soils occupy ridgetops and benches near tops of plateaus and mountains. Molly and Suttler soils occupy small areas on mountains and on ridgetops.

The soils of this association are used mainly for producing timber, and trees grow well on them. Some areas are used for limited grazing.

Lack of soil stability in subgrades, cutbanks, and fill slopes hinders construction of roads on soils of this association. Jughandle soils are sandy throughout, and except where traffic is heavy, roads built on them generally need not be surfaced with gravel.

This association provides excellent habitat for wildlife. The areas generally are not suitable for recreational purposes.

5. Klicker-Gwin-Mehlhorn Association

Moderately deep and shallow, hilly to very steep, stony and rocky soils that have a surface layer of silt loam and loam and a subsoil of silt loam to silty clay loam; on canyon sides

In this association are hilly to very steep soils in canyons along the Clearwater River and its tributaries (see cover picture). Slopes are long; they extend from the ridges of the plateau to the bottom lands along the rivers and creeks. A part of the total acreage is on narrow ridgetops, valley bottom lands, terraces, and alluvial fans. Elevation ranges from 1,000 to 4,000 feet. Average annual precipitation ranges from about 21 to 28 inches. The average annual temperature ranges from about 46° to 51° F., and the frost-free season ranges from 70 to 160 days.

Originally more than half the Area was forested, and Douglas-fir and ponderosa pine were the dominant trees. Many south- and west-facing slopes, however, had a cover consisting chiefly of grasses and forbs, though shrubs grew in some places.

Most soils of this association formed in material weathered from basalt. In the southwestern part of the Area, however, some of the soils formed in material weathered from andesite or from greenstone. In places the soils formed partly in wind-laid material and partly in material weathered from the underlying rock. Most of the soils are moderately deep or shallow to bedrock, but some are deep. Many of the soils contain varying amounts of stones. In some areas rock crops out.

This association occupies about 23 percent of the Area. Klicker soils make up about 40 percent of the acreage, and the Gwin and Mehlhorn soils another 40 percent. The remaining 20 percent is minor soils.

Klicker soils are moderately deep and are well drained. They have a surface layer of brown to dark brown silt loam. Their subsoil is brown and is silt loam in the upper part and cobbly and gravelly silty clay loam below.

The Gwin and Mehlhorn soils formed on slopes that face south, under grasses, forbs, and shrubs. They occur in a complex pattern in many places. Gwin soils are well drained or somewhat excessively drained. They are shallow to basalt bedrock and commonly are stony. Their surface layer is dark grayish-brown to brown loam, and the subsoil is brown silty clay loam. Mehlhorn soils are moderately deep to basalt bedrock. They are well drained. Their surface layer is dark-brown loam, and their subsoil is dark-brown or brown gravelly clay loam.

Minor soils in this association are the Jacknife, Nicodemus, and Sallyann. Jacknife soils formed in local alluvium and colluvium on terraces, alluvial fans, and foot slopes adjacent to, or near, steep canyon slopes. Nicodemus soils are on bottom lands. Sallyann soils, in the southwestern part of the Area, formed chiefly in material weathered from greenstone or related andesitic metamorphic rocks.

Most areas of this soil association are too steep for crops. The soils are used mainly for producing timber, for grazing by wildlife, and as wildlife habitat. Some areas provide suitable sites for homes and towns. Douglas-fir and ponderosa pine grow well on the Klicker and Sallyann soils, and pasture and range grasses do well on the other soils. The farms and ranches in this association are fairly large. They commonly include both soils used for grazing and soils used for timber production. Many of the farmsteads are in the valleys, where the soils are used intensively for crops and gardens. Most of the towns and villages also are in this association along the Clearwater River.

Steep slopes and nearness of basalt bedrock to the surface make it difficult to build roads in most parts of this association. Any roads that are built need some surfacing material, which can be obtained by crushing rock available in local outcrops. Suitable sites for ponds are scarce. Deer graze on the vegetation of the Gwin and Mehlhorn soils in winter and on the vegetation of all the soils in the association in summer.

6. Molly Association

Deep and very deep, hilly to very steep soils that have a surface layer of loam and subsoil of loam or silt loam; on uplands

The soils of this association occur mainly in the northeastern part of the Area on uplands. They are hilly to very steep. Elevation ranges from 3,000 to 5,000 feet. Average annual precipitation ranges from 30 to 40 inches. The average annual temperature is about 42° F., and the frost-free season ranges from 60 to 110 days.

The soils formed in wind-laid silt material and in material weathered from quartz monzonite, granite, gneiss, mica-schist, and similar coarse-grained acidic igneous or metamorphic rocks. Most areas have a cover of grand fir and western redcedar, but western white pine, western larch, and Douglas-fir grow in some areas.

This association occupies about 4 percent of the Area. Molly soils make up about 90 percent of this association, and minor soils the rest.

Molly soils are deep and very deep and are well drained or somewhat excessively drained. They have a thin organic layer underlain by yellowish-brown and brown to light yellowish-brown loam or silt loam. Below is pale-brown to pale-yellow sandy loam.

Minor soils are the Suttler, the Jughandle, and small areas of other soils along streams. Of these Suttler soils make up about 5 percent of the association. Suttler soils are dominantly loam in texture, and Jughandle soils are dominantly sandy loam.

Most soils of this association are used for producing timber, though limited grazing is done in places. Some of the less steep soils are suitable for roads, but most of the soils are too steep for recreational sites. Lack of soil stability in cutbanks and fills are problems in road building. Material must be provided for surfacing roads, and drainage of the roadway must be furnished.

This soil association provides good habitat for bear, deer, elk, and other wildlife in the Area.

7. Helmer-Brody Association

Very deep to moderately deep, undulating to very steep soils that have a surface layer of silt loam and a subsoil of silt loam and silty clay loam; on uplands

In this association are undulating to rolling soils on high ridges, hilly soils on uplands that adjoin the ridges, and steep to very steep soils in canyons. These soils are mostly in the central and north-central part of the Area. The ridges are broad, and in a few places drainage is somewhat poor. Elevation ranges from 2,500 to 6,500 feet. Average annual precipitation ranges from about 26 to 40 inches. The average annual temperature ranges from 40° to 47° F., and the frost-free season ranges from 50 to 100 days.

The dominant soils of this association formed in wind-laid silty material. Some of the soils, however, formed partly in material weathered from basalt. Originally the soils had a cover of trees, mainly grand fir, western redcedar, western white pine, Douglas-fir, western larch, and associated plants.

This association occupies about 10 percent of the Area. About 34 percent is Helmer soils, about 25 percent is Brody soils, and the remaining 41 percent is minor soils.

Helmer soils occupy ridges and adjacent uplands in this association and are undulating to steep. They are very deep and are well drained. These soils have a thin organic layer underlain by brown or yellowish-brown silt loam. Below is pinkish gray or light-brown and brown silt loam underlain by brown silty clay loam.

Brody soils are steep and occur mainly in canyons adjoining areas of Helmer soils. The Brody soils are moderately deep and are well drained or somewhat excessively drained. They have a thin organic layer over brown cobbly silt loam and contain varying amounts of rock fragments.

Minor soils in this association are the Caribel and Potlatch. Caribel soils, which are well drained, occupy areas along the edge of Helmer soils. Potlatch soils are somewhat poorly drained and are near the town of Glenwood.

This association is used chiefly for timber production and limited grazing. In places, particularly near Glenwood, the undulating to hilly soils on ridges are used for small grains, hay, and pasture. The farms are small, and much of the acreage is wooded. Unsurfaced roads on soils of this association become soft and almost impassable during wet periods. This association is a year-round habitat for deer. In places the topography is favorable for recreational sites.

This section describes the soil series and the mapping units of the Kooskia Area in alphabetical order. The procedure is first to describe the soil series, and then the mapping units in that series. Thus to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the series to which it belongs. The description of a soil series mentions features that apply to all the soils in a series. Differences among the soils of one series are pointed out in the description of the individual soils or are indicated in the soil name.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock land, for example, is a miscellaneous land type that does not belong to a soil series. It is listed, nevertheless, in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and the woodland group in which the mapping unit has been placed. The page on which each capability unit and woodland group are described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The typical profile for each series that is described in the first mapping unit is for scientists, engineers, and others who need to make highly technical soil interpretations. The layers, or horizons, are designated by symbols, such as A1, B21t, and C1. These symbols have special meaning for soil scientists. Many readers, however, need only remember that symbols beginning with "A" are for surface soil; those with "B" are for subsoil; those with "C" are for substratum, or parent material; and those with "R" are for bedrock. All measurements refer to depth from the surface in the mineral soils.

The color of each horizon is described in words, such as yellowish brown, and it is also indicated by symbols for hue, value, and chroma, such as 10YR 5/4. These symbols, called Munsell color notations, are used by soil scientists to evaluate the color of the soil precisely (12) 2/. Unless otherwise stated all color terms and terms for consistence in the survey are for dry soil.

Estimates of available water capacity given in the descriptions of the mapping units are for variable depths influenced by the depth to which roots of most plants extend into the profile of each mapping unit. At this depth the soil normally contains the roots of most native or cultivated crop plants, but it does not contain all of the roots of trees and other deep-rooted woody plants.

Many of the terms used to describe the soils are defined in the Glossary at the back of this soil survey. For more general information about the soils, the reader can refer to the section "General Soil Map," where broad patterns of the soils are described. The approximate acreage and proportionate extent of the soils are given in table 1, and their location and extent are shown on the detailed soil map at the back of this survey.

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2 Italic numbers in parentheses refer to Literature Cited, p. 92.

Brody Series

The Brody series consists of moderately deep, well-drained to somewhat excessively drained, steep soils on sharp ridges and long slopes in the mountains. These soils formed mainly in material weathered from basalt. The upper layers, however, formed partly in wind-laid silty material.

Elevation ranges from 2,500 to 6,000 feet. The annual precipitation is 30 to 40 inches, and the average annual temperature is 40° to 47° F. The average frost-free season is about 60 to 100 days. On these soils the vegetation is mainly grand fir, western redcedar, western white pine, and other coniferous trees that have an understory of forbs and shrubs.

Brody soils are next to Helmer soils in places. They are used as woodland and also provide summer range for big game.

Brody cobbly silt loam, 35 to 65 percent slopes (BcE).--This is the only Brody soil mapped in the survey area. It is mainly on slopes that face north. The surface layer and subsoil are dark brown to brown cobbly or gravelly silt loam. Basalt rock is at a depth of about 30 inches.

Typical profile on a 52 percent slope that faces northeast under grand fir, western redcedar, and western white pine; 0.3 mile east on Lolo Creek Road past Cedar Creek Road and 0.5 mile to the right to pit on right side of road; in the NE 1/4 of SW 1/4 sec. 7, T. 34 N., R. 6 E. (profile 60-Ida-25-7 sampled for laboratory analysis):

O11--2 inches to 1.5 inches, undecomposed needles, leaves, cones, and twigs; pH 4.5; abrupt, broken boundary.

O12--1.5 inches to 0.2 inch, very dark brown (10YR 2/2), partly decomposed needles, leaves, cones, and wood; pH 4.4; abrupt, broken boundary.

O2--0.2 inch to 0, very dark brown (10YR 2/2), well-decomposed organic matter; pH 5.2; abrupt, wavy boundary.

B21ir--0 to 3 inches, brown (7.5YR 5/4) cobbly silt loam, dark brown (7.5YR 3/3) when moist; about 20 percent is angular basalt cobblestones and pebbles; weak or moderate, very fine and fine, crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and medium roots; many micro interstitial pores; a few bleached sand grains at surface of horizon; pH 5.9; gradual, wavy boundary.

B22ir--3 to 13 inches, brown (7.5YR 5/4) cobbly silt

TABLE 1.--APPROXIMATE ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Soil	Acres	Percent	Soil	Acres	Percent
Brody cobbly silt loam, 35 to 65 percent slopes	8,010	2.5	Kooskia silt loam, 0 to 7 percent slopes	9,576	3.0
Caribel silt loam, 0 to 7 percent slopes	1,546	.5	Kooskia silt loam, 7 to 12 percent slopes	6,394	2.0
Caribel silt loam, 7 to 12 percent slopes	5,391	1.7	Kooskia silt loam, 7 to 12 percent slopes, eroded	1,645	.5
Caribel silt loam, 12 to 25 percent slopes	6,875	2.2	Kooskia silt loam, 12 to 25 percent slopes	4,045	1.3
Caribel silt loam, 12 to 25 percent slopes, eroded	265	.1	Kooskia silt loam, 12 to 25 percent slopes, eroded	4,214	1.3
Caribel silt loam, 25 to 45 percent slopes	3,407	1.1	Lochsa sandy loam, 25 to 65 percent slopes	13,690	4.3
Colville loam, noncalcareous variant	1,240	.4	Lochsa soils, 65 to 90 percent slopes	575	.2
Greencreek loam, 5 to 30 percent slopes	2,409	.8	Lochsa-Yakus sandy loams, 30 to 65 percent slopes	364	.1
Gwin-Klicker stony loams, 40 to 65 percent slopes	1,371	.4	Lochsa-Yakus rocky complex, 30 to 65 percent slopes	12,969	4.1
Gwin-Mehlhorn stony loams, 12 to 45 percent slopes	7,767	2.5	Mehlhorn-Gwin loams, 25 to 45 percent slopes	921	.3
Gwin-Mehlhorn stony loams, 45 to 65 percent slopes	18,018	5.7	Mixed alluvial land	219	.1
Gwin-Sallyann stony loams, 35 to 65 percent slopes	2,020	.6	Molly loam, 12 to 30 percent slopes	2,888	.9
Helmer silt loam, 0 to 7 percent slopes	1,135	.3	Molly loam, 30 to 65 percent slopes	3,277	1.0
Helmer silt loam, 7 to 12 percent slopes	3,633	1.1	Nicodemus loam, 0 to 7 percent slopes	2,843	.9
Helmer silt loam, 12 to 25 percent slopes	3,972	1.2	Nicodemus loam, 7 to 12 percent slopes	187	.1
Helmer silt loam, 25 to 45 percent slopes	1,990	.6	Potlatch silt loam, 0 to 7 percent slopes	953	.3
Helmer silt loam, loamy variant, 5 to 20 percent slopes	907	.3	Potlatch-Greencreek loam, 7 to 25 percent slopes	535	.2
Jacknife silt loam, 7 to 12 percent slopes	615	.2	Riverwash	218	.1
Jacknife silt loam, 12 to 25 percent slopes	2,480	.8	Rock land	3,334	1.0
Jacknife silt loam, 12 to 25 percent slopes, eroded	1,173	.4	Rock outcrop	2,391	.7
Jacknife silt loam, 25 to 45 percent slopes	646	.2	Sallyann stony loam, 30 to 65 percent slopes	6,543	2.1
Jacknife silt loam, loamy variant, 0 to 7 percent slopes	230	.1	Suttler loam, 7 to 12 percent slopes	296	.1
Jacknife silt loam, loamy variant, 7 to 12 percent slopes	287	.1	Suttler loam, 12 to 30 percent slopes	8,925	2.8
Jacknife silt loam, loamy variant, 12 to 25 percent slopes	355	.1	Suttler loam, 30 to 65 percent slopes	33,395	10.6
Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded	165	.1	Weedmark loam, 12 to 25 percent slopes	1,316	.4
Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes	1,025	.3	Weedmark loam, 12 to 25 percent slopes, eroded	448	.1
Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes, eroded	203	.1	Weedmark loam, 25 to 45 percent slopes	2,418	.8
Jughandle sandy loam, 12 to 35 percent slopes	5,003	1.6	Weedmark silt loam, 7 to 12 percent slopes	497	.2
Jughandle sandy loam, 35 to 65 percent slopes	75,707	23.9	Yakus coarse sandy loam, 12 to 40 percent slopes	862	.3
Klicker rocky silt loam, 12 to 40 percent slopes	6,099	1.9	Yakus coarse sandy loam, 40 to 65 percent slopes	3,339	1.1
Klicker rocky silt loam, 40 to 65 percent slopes	20,703	6.5	Yakus-Lochsa sandy loams, 40 to 65 percent slopes	875	.3
			Water	1,561	.5
			Total	316,360	100.0

loam that is similar to the B21ir horizon but has slightly higher value and chroma when dry and is dark brown (7.5YR 3/4) when moist; about 15 percent is angular and subangular basalt cobblestones and pebbles; weak or moderate, very fine and fine, crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and medium roots; many micro interstitial pores; pH 6.2; clear, wavy boundary.

B3ir--13 to 30 inches, brown (7.5YR 5/4), cobbly and gravelly silt loam that has about 3 to 5 percent more clay than the B22ir horizon; dark brown (7.5YR 3/4) when moist; about 70 to 80 percent is coarse basalt fragments that are mostly angular gravel and cobblestones; weak, medium, subangular blocky and weak or moderate, very fine and fine, crumb structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine and medium roots; many very fine tubular pores; no evidence of clay films; pH 6.1; gradual, irregular boundary.

R--30 inches, fractured basalt bedrock; between the fractures and making up about 5 percent of the material is gravelly loam similar to that in the B3ir horizon; pH 6.2.

The O horizon is missing in places in disturbed areas. The B2ir horizon contains an accumulation of iron oxides. In this horizon the content of organic matter ranges from 1.5 to 4 percent, and the content of coarse fragments is less than 40 percent. The B21ir and B22ir horizons are slightly gritty. In the B3ir horizon the content of coarse fragments ranges from 50 to 90 percent. Depth to fractured bedrock ranges from 20 to 40 inches. Roots readily penetrate to the bedrock and into the fractures.

Available water capacity is low in Brody cobbly silt loam, 35 to 65 percent slopes. Fertility is moderately low. Permeability is moderate in the subsoil. Runoff is rapid. The erosion hazard is severe.

This soil is used mostly for producing timber, to which it is well suited. It is also used as summer range by big game. Capability unit VIIe-1; woodland group 3; not used as range.

Caribel Series

The Caribel series consists of deep and very deep, well-drained, nearly level to steep soils. These soils formed mainly in material weathered from basalt.

These soils are on plateaus that are dissected by canyons and smaller drainageways. Elevation ranges from 2,800 to 3,400 feet. The average annual precipitation is 27 to 30 inches, and the average annual soil temperature is about 48° F. The frost-free season is about 90 to 125 days.

The vegetation on soils in this series consists mostly of Douglas-fir and ponderosa pine, but tall brush grows in places.

Caribel soils are next to Klicker soils in places. Some areas of the nearly level to moderately steep Caribel soils are used for crops and pasture. The rest of the acreage is woodland. This woodland is valuable as a source of wood products, as sites for recreation and camping, and as summer range for big game.

Caribel silt loam, 0 to 7 percent slopes (CaA).--This soil occupies large areas on the less dissected parts of broad ridges near Glenwood and near the community of Caribel and on a few ridges in other parts of the survey area.

The surface layer is reddish-brown silt loam about 8 inches thick. The subsoil is mostly reddish-brown silty clay loam. Basalt bedrock is at a depth of about 73 inches. The horizons cannot be clearly distinguished in this soil (pl. II).

Typical profile on a 5 percent convex slope under Douglas-fir and ponderosa pine, about 3 1/2 miles west of Glenwood and 840 feet north of intersection of gravel and logging roads, and then 50 feet east in the SW 1/4 of SW 1/4 sec. 36, T. 34 N., R. 4 E. (profile 60-Ida-25-33):

O11--1 inch to 0.8 inch, slightly decomposed and undecomposed needles, cones, and woody material; pH 5.2; abrupt, wavy boundary.

O12--0.8 inch to 0.2 inch, matted, moderately decomposed needles, leaves, cones, and woody material; fungi in places; pH 5.4; abrupt, wavy boundary.

O2--0.2 inch to 0, very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2), matted, well-decomposed, organic matter and common partly decomposed needles and woody material, very dark brown (10YR 1/2) when moist; strong, very fine and fine, granular structure; slight content of white fungi in places; pH 5.1 to 4.8; abrupt, wavy boundary.

A11--0 to 2 inches, reddish-brown (5YR 4/3) silt loam (5YR 5/3, rubbed); a few hard rock pellets or concretions 1 to 2 millimeters in diameter, dark reddish brown (5YR 2/2) (5YR 3/3, rubbed) when moist; top one-fourth inch is darker and grayer than rest of horizon; very weak, thin, platy and strong or moderate, very fine and fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial pores; fungi in places; peds do not slake in water after 5 minutes; pH 5.7; clear, wavy boundary.

A12--2 to 8 inches, reddish-brown (5YR 4/3) silt loam (5YR 5/4, rubbed), dark reddish brown (5YR 3/3) when moist; a few, reddish-brown, strongly weathered, very fine basalt pebbles 2 to 5 millimeters in diameter; weak, thin, platy and strong, very fine and fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fibrous and fine roots; common, very fine, tubular pores; peds do not slake after 5 minutes in water; pH 5.6; clear, wavy boundary.

B1t--8 to 13 inches, reddish-brown (5YR 4/3) heavy silt loam or light silty clay loam (5YR 5/4, rubbed); dark reddish brown (5YR 3/3) (5YR 3/4, rubbed) when moist; a few, weathered, very fine basalt pebbles 2 to 5 millimeters in diameter; moderate, fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine and medium and a few coarse roots; common, very fine, tubular pores; thin, patchy (5YR 3/4 moist) clay films on peds and in channels; a few, soft and semihard, black concretions; peds slake in water after 1/2 minute; pH 5.6; gradual, wavy boundary.

B21t--13 to 24 inches, reddish-brown (5YR 4/4) silty clay loam (7.5YR 5/4, rubbed), dark reddish brown (5YR 3/4) when moist; a few, strongly weathered, very fine basalt pebbles 2 to 5 millimeters in diameter; moderate or weak, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; common fibrous roots and a few fine and medium roots; common very fine and a few, fine and medium, tubular pores; medium patchy or thin continuous clay films on peds and in channels that are slightly darker and redder than horizon material; common, semihard, black concretions; a few, black, manganese stains on peds; pH 5.8; gradual, wavy boundary.

B22t--24 to 41 inches, reddish-brown (5YR 4/4) silty clay loam (7.5YR 5/4, rubbed), dark reddish brown (5YR 3/4) (7.5YR 3/4, rubbed) when moist; many, strongly decomposed, semihard, light-gray (10YR 7/2) and very pale brown (10YR 7/4) basalt fragments up to 3/10 inch in diameter; very weak, coarse, prismatic and weak, fine and medium, subangular blocky structure; hard, firm, sticky, plastic; a few, fibrous, fine and medium roots; many, very fine and fine, tubular pores; medium patchy or thin continuous clay films on peds and in pores; many black manganese stains on peds; many soft concretions 5/10 to 2 millimeters in diameter; pH 5.6; gradual, wavy boundary.

B23t--41 to 57 inches of material similar to that in B22t horizon except the interior of the peds is slightly browner and the clay films are slightly redder, and structure is slightly stronger; very hard; pH 5.4; gradual, wavy boundary.

B3t--57 to 73 inches, brown (7.5YR 5/4), very fine gravelly silty clay loam, reddish brown (5YR 4/4) when moist; about 30 percent is fragments of weathered basalt up to 5 millimeters in diameter; weak, coarse and medium, subangular blocky structure; very hard, firm, sticky, plastic; a few fibrous and fine roots; common, very fine, tubular pores; medium, continuous, reddish-brown (5YR 4/4) clay films on vertical surfaces of peds and in channels; channels are dark reddish brown (5YR 3/4) when moist; a few, black manganese stains on peds; pH 5.0; abrupt, wavy boundary.

R--73 inches, weathered basalt bedrock.

The 0 horizon is 1 to 2 inches thick in undisturbed areas, and it is lacking in areas that have been cultivated or burned. The A11 horizon is reddish-brown or brown silt loam. It has strong or moderate, fine, granular or weak, thin, platy structure. The content of organic matter in this horizon ranges from 4 to 10 percent. The upper horizons of this soil have a color value darker than 5.5 when dry and darker than 3.5 when moist. At a depth of 10 to 18 inches the content of organic matter is more than 1 percent. No A2 horizon is evident, and no bleached silt coatings are on peds. The B2t horizon is silty clay loam or clay loam and has thin to medium, patchy to continuous clay films on peds. Chroma in the Bt horizon is 4 or less when the material is dry. Base saturation is less than 35 percent in places in this horizon. It decreases with depth in other places in the Bt horizon or in the C horizon. The A11, A12, B1t, and B21t horizons are slightly gritty, and the B22t and B23t horizons are gritty. Depth to bedrock ranges from 48 to 73 inches.

Available water capacity is high in Caribel silt loam, 0 to 7 percent slopes. Fertility is moderate. Permeability is moderately slow in the subsoil. Runoff is slow, and the erosion hazard is slight. The soil tends to compact if it is worked when wet.

About 10 percent of the acreage of this soil is used for crops and pasture, and the rest is woodland. The principal crops are small grains, clover, alfalfa, and grasses. Capability unit IIIe-1; woodland group 2.

Caribel silt loam, 7 to 12 percent slopes (CaB).--This soil has longer and steeper slopes than Caribel silt loam, 0 to 7 percent slopes, but otherwise the two soils are similar. Runoff is medium on this soil, and the erosion hazard is moderate. In places this soil has lost from 2 to 6 inches of the original surface soil. These areas are indicated by an erosion symbol on the detailed soil map.

About 35 percent of the acreage is used for cultivated crops. The rest is woodland. The soil is suited to small grains, clover, alfalfa, and grasses. It is also suited to trees. Capability unit IIIe-1; woodland group 2; not used as range.

Caribel silt loam, 12 to 25 percent slopes (CaC).--Runoff is medium on this soil, and the erosion hazard is moderate. Areas that are moderately eroded in places were included in mapping.

About 20 percent of the acreage of this soil is cropland. The rest is woodland. This soil is better suited to hay and pasture crops than to other uses, though small grains and peas can be grown. Capability unit IVe-1; woodland group 2; not used as range.

Caribel silt loam, 12 to 25 percent slopes, eroded (CaC2).--About 4 to 8 inches of the original surface layer of this soil remains in one-half to two-thirds of the areas. Runoff is medium, and small gullies have formed where water collects. Small areas are severely eroded, and fairly large areas are slightly eroded.

Most areas of this soil are cultivated. The soil is better suited to hay and pasture than to other uses. It also is well suited to trees. Capability unit IVe-1; not used as range or as woodland.

Caribel silt loam, 25 to 45 percent slopes (CaD).--The subsoil of this soil contains somewhat less clay than Caribel silt loam, 0 to 7 percent slopes, and depth to bedrock is 40 to 55 inches. Runoff is rapid, and the erosion hazard is severe.

Nearly all of the acreage of this soil is woodland. The areas are used as summer range by big game.

The soil is suited to trees and to grasses and legumes commonly grown for pasture. Capability unit VIe-1; woodland group 2; not used as range.

Colville Series, Noncalcareous Variant

Soils of the Colville series, noncalcareous variant, are deep and are somewhat poorly drained. They are on bottom lands and alluvial fans. These soils formed in alluvium that came mostly from weathered granite, quartz monzonite, gneiss, schist, and related rocks.

Elevation ranges from 1,200 to 3,300 feet. The annual precipitation is 20 to 30 inches. The average annual soil temperature is about 49° F., and the frost-free season is 90 to 140 days.

The vegetation on these soils consists mainly of grasses, sedges, and rushes, but willow, western redcedar, and grand fir grow in places.

These soils are used mostly for grazing by livestock and big game.

Colville loam, noncalcareous variant (Co).--The surface layer of this soil is very dark gray loam or silt loam about 12 inches thick. The subsoil is light-gray or gray mottled clay loam that extends to a depth of about 45 inches. It is underlain by stratified sandy clay loam and loamy sand that is gravelly or loamy in places. Slopes range from 0 to 3 percent.

Typical profile of Colville loam, noncalcareous variant, under grass pasture on bottom land of Meadow Creek; about 300 feet northeast of the road in SE 1/4 of NW 1/4 sec. 35, T. 30 N., R. 4 E.:

O1--1 inch to 0, matted grass and roots; pH 6.0; abrupt, broken boundary.

A1--0 to 12 inches, very dark gray (2.5Y 3/1) heavy loam or silt loam; black (10YR 1/1) when moist; moderate, fine and very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; root mat to a depth of 2 inches, but many fine and fibrous roots below that depth; many micro interstitial pores and many, very fine, tubular pores; pH 5.4; gradual, smooth boundary.

IIB21g--12 to 22 inches, light-gray or gray (5Y 6/1) clay loam; dark gray (5Y 4/1) when moist; many, fine, faint, gray (5Y 5/1) mottles and common, coarse, faint, gray (2.5Y 5/1) mottles that are very dark gray (2.5Y 3/1) when moist; a few, fine, distinct, yellowish-brown (10YR 5/6, moist) mottles; very weak, medium, prismatic and weak, medium, subangular blocky structure; hard, friable, sticky, plastic; a few fine roots; common, very fine, tubular pores; a few, soft, black concretions 1 millimeter in diameter; moderately micaceous; slightly acid; clear, smooth boundary.

IIB22g--22 to 45 inches, light-gray or gray (2.5Y 6/1) clay loam; dark gray (5Y 4/1) when moist; many, medium and coarse, distinct, dark-gray (2.5Y 4/1) mottles that are very dark gray (2.5Y 3/1) when moist; a few, fine, distinct, light olive-brown (2.5Y 5/4) and brown (7.5YR 5/4) mottles that are yellowish brown (10YR 5/4) when moist; weak, medium, subangular blocky structure; hard, friable, sticky, plastic; a few fine roots; common, very fine, tubular pores; a few, soft, concretions 1 millimeter in diameter; moderately micaceous; slightly acid; abrupt, smooth boundary.

IIC1g--45 to 50 inches, gray (5Y 5/1) sandy clay loam; very dark gray (5Y 3/1) when moist; a few, fine, faint, darker mottles; massive; hard, friable, sticky, plastic; a few fine roots; common, very fine, tubular pores; much mica; neutral reaction; abrupt, smooth boundary.

IVC2g--50 to 60 inches, gray loamy sand; dark gray when moist; a few, fine mottles; massive; soft, very friable, nonsticky, nonplastic.

The A1 horizon ranges from dark gray to very dark gray when dry. At a depth of 10 to 24 inches, the color value is darker than 5.5 when dry and darker than 3.5 when moist. In places the lower part of the A1 horizon and the upper part of the IIB21g horizon have a low chroma or other colors that indicates wetness. No textural B horizon is present. The profile is dominantly clay loam or silty clay loam at a depth between 6 and 40 inches. It is noncalcareous and is strongly acid to neutral to a depth of 40 inches. In many pastured areas a root mat occurs that is 1 to 2 inches thick.

Runoff is slow on Colville loam, noncalcareous variant. The water table is at a depth between 2 and 4 feet for most of the year. Permeability is moderately slow. Available water capacity and fertility are high.

A small acreage of this soil is used for hay, and timber is harvested in a few areas. This soil is used mainly as pasture for livestock and big game. The areas also provide habitat for waterfowl and beavers. Capability unit IIIw-1; not used as range or as woodland.

Greencreek Series

The Greencreek series consists of deep and very deep, well-drained, gently sloping to steep soils. These soils formed in alluvium; colluvium, in material deposited by landslides; and in material weathered from quartzite, mica-schist, gneiss, granite, quartz monzonite, or similar rocks.

Elevation ranges from 2,700 to 3,800 feet. The annual precipitation is 28 to 32 inches, and the average annual soil temperature is about 48° F. The average annual frost-free season is 100 to 140 days.

The natural vegetation on these soils is mainly ponderosa pine and Douglas-fir. Grand fir grows in places.

Greencreek soils are near the Suttler and Potlatch soils.

Greencreek loam, 5 to 30 percent slopes (GcC).--This soil is on high terraces, old alluvial fans, landslide deposits, and uplands next to or near Meadow Creek and Lightning Creek in the southern part of the Area.

The surface layer is about 6 inches of brown loam, and the subsurface layer is about 8 inches of light-brown cobbly loam. The subsoil is reddish-yellow and red clay loam. It has variegations, streaks, and mottles of various shades of yellow, red, brown, gray, and white in the lower part. The soil is strongly acid to very strongly acid.

Typical profile under ponderosa pine, Douglas-fir, and grand fir on a 17 percent slope that faces west; 1.2 miles northeast of Meadow Creek Bridge on Quartz Creek Road, 0.4 mile east of the junction of the logging road to the north, and 55 feet northeast of the road; in the NW 1/4 of SE 1/4 sec. 35, T. 30 N., R. 4 E.:

O11--2 to 1.5 inches, nearly undecomposed needles, leaves, and twigs; pH 6.2.

O12--1.5 inches to 0.7 inch, moderately decomposed needles, leaves, twigs, and woody material that are somewhat matted; spots of white fungi in places; pH 5.9.

O2--0.7 to 0 inch, very dark gray (10YR 3/1) well-decomposed organic material that contains a few plant remains and some charcoal; black (10YR 2/1) when moist; moderate, very fine, granular structure; pH 5.8; abrupt, wavy boundary.

A11--0 to 2 inches, brown (7.5YR 5/2) slightly gravelly loam very dark brown (7.5YR 2/2) when moist; weak, medium, platy and moderate or weak, fine and medium, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fibrous and fine roots and a few medium roots; many micro interstitial pores and a few, very fine, tubular pores; a few uncoated grains of silt and sand; a few angular and subangular quartz pebbles and many other pieces of quartz; pH 5.0; clear, smooth boundary.

A12--2 to 6 inches, brown (7.5YR 5/3) loam; dark brown (7.5YR 3/3) when moist; very weak, thin, platy and moderate or weak, fine and medium, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fibrous and fine and common medium roots and a few coarse roots; many micro interstitial pores and very fine tubular pores; no clay films; a few partly uncoated grains of silt and sand; a few angular and subangular quartz pebbles and many other pieces of quartz; pH 5.1; clear, wavy boundary.

A2--6 to 14 inches, light-brown (7.5YR 6/3) stony, cobbly heavy loam (7.5YR 6/4, rubbed), reddish brown (5YR 4/3) to brown (7.5YR 5/4) when moist, that is about 30 percent coarse fragments, mostly quartz; weak, fine and medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common, fibrous, fine and medium roots; common, very fine, tubular pores and many micro interstitial pores; a few micro and very fine vesicular pores; thin, patchy, clay films in some pores; a few to common uncoated grains; slight partly bleached silt and very fine sand coating on peds; a few angular and subangular quartz pebbles and many other pieces of quartz; pH 5.4; some splotches of reddish-brown (5YR 5/3) clay loam that is reddish-brown (5YR 4/3) when moist; clear, wavy boundary.

B&A--14 to 16 inches, reddish-brown (5YR 5/5) and light yellowish-brown (10YR 6/4) cobbly light clay loam or heavy loam (7.5YR 6/5, rubbed), reddish-brown (5YR 4/4) and brown (7.5YR 5/4) (7.5YR 4/4, rubbed) when moist; about 20 percent is pebbles, cobblestones, and other stones, mostly angular and subangular pieces of quartz; many coatings, less than 1 millimeter thick, of light-gray (10YR 7/2) and pinkish-gray (7.5YR 7/2), bleached silt and very fine sand on peds and as very fine lenses and spots permeating the dominant browner matrix, light brownish gray (10YR 6/2) when moist; moderate, fine and medium, subangular blocky structure; hard or very hard, friable, slightly sticky, slightly plastic; a few, fibrous, fine, and medium roots; a few, very fine, tubular pores; medium, continuous or patchy, clay films in some channels and thin and medium clay films as bridges between grains; in places clay films in channels are free of bleached grains; pH 4.7; clear, wavy boundary.

B21t--16 to 22 inches, reddish-yellow (7.5YR 6/5), heavy clay loam that is brown (7.5YR 5/4) and reddish brown (5YR 5/4) when moist and is about 10 percent cobblestones and pebbles, mostly angular and subangular quartz; weak, coarse, prismatic and moderate, coarse and medium, subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; a few fibrous, fine, and medium roots; a few or common, very fine, discontinuous, tubular pores; medium or thick, continuous,

reddish-brown (5YR 4/4 and 5YR 5/4), clay films in places on ped surfaces that are reddish brown (2.5YR 4/4 and 5YR 4/4) and dark reddish brown (5YR 3/4) when moist; thick, continuous, clay films in pores, and as bridges between grains; thick, bleached, white (10YR 8/2) and light-gray (10YR 7/2) coating on main vertical surfaces and on most peds, gray (10YR 6/1 and 5YR 6/1) or pinkish-gray (7.5YR 6/2) when moist; bleached coatings are on many of the clay films and in channels and occur as splotches, fine streaks, and spots or fine lenses that are less than 2 millimeters across in the matrix; pH 4.5; gradual, wavy boundary.

B22t--22 to 31 inches, reddish-yellow (7.5YR 6/6 and 7/6) clay loam; strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) when moist; weak, coarse and very coarse, prismatic and moderate, coarse and very coarse, subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; a few fibrous and fine roots; a few, very fine, tubular pores; thick and medium, continuous, reddish-brown (5YR 5/3 and 5/4) clay films on some peds, reddish-brown (2.5YR 4/4) and weak red (2.5YR 4/2) when moist and as bridges between grains; main vertical surfaces of prisms and blocks have coatings up to 2 or 3 millimeters in thickness of gray (5YR 6/1 and 5YR 5/1) (dark gray 5YR 4/1 and very dark gray 5YR 3/1 when moist) clayey material that may be kaolin; this material surrounds some root channels and is in small splotches, spots, and lenses in the matrix; the prisms and, in places, the blocks have a white (10YR 8/1) coating of silt and very fine sand that is light gray (10YR 7/1) when moist; pH 4.6; gradual, wavy boundary, water seeps out at one place in this horizon.

B23t--31 to 39 inches, reddish-yellow (7.5YR 6/7) (about 60 or 70 percent) and white (10YR 8/1 and 8/2) clay loam, strong brown (7.5YR 5/6) and light gray (10YR 6/1) when moist; very weak, coarse, prismatic and moderate, fine, subangular and angular blocky structure; very hard, firm, slightly sticky, plastic; a few, fibrous, fine, and medium roots, mostly in cracks that contain white material; a few, very fine, tubular pores in the reddish-yellow material and common ones in the white material; main vertical surfaces coated with 1 to 3 millimeters of the white material (light gray when moist); this material also surrounds root channels; thick, continuous, reddish-brown (5YR 5/4 and 2.5YR 5/4) (5YR 4/4 and 2.5YR 4/4 moist) clay films in places on peds and moderate, continuous clay films of this color on most peds; in places quartzite pebbles are decomposed enough that they can be broken in the hand; pH 4.5; clear, irregular boundary; reddish-yellow material is dominant in most places, but white material is dominant in others.

B31t--39 to 46 inches, reddish-yellow (7.5YR 6/7) gravelly clay loam that is about 20 percent pebbles, cobblestones, and other stones, yellowish red (5YR 4/6 and 5/6) when moist; some variegations of very pale brown (10YR 7/4) and light-yellowish brown (10YR 6/4); weathered quartzite is yellow (10YR 7/6) and brownish-yellow (10YR 6/6), but it otherwise is similar to that in the B32t horizon except it has less white streaks, a weak, very fine, angular blocky structure, and pH is 4.5; clear, wavy boundary.

B32t--46 to 58 inches, red (2.5YR 5/6) clay loam that is about 10 percent cobblestones and other stones, red (10R 4/5) or weak red (10R 4/4) when moist; about 10 to 20 percent of the mass has brownish-yellow (10YR 6/6) and reddish-yellow (7.5YR 6/6) streaks and coarse splotches that are yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6), respectively, when moist; a few pale-red (10YR 6/4) splotches; a few old root channels filled with decayed roots and material that is stained very dark gray (5YR 3/1); color surrounding the root channels is gray (10R 5/1) (10YR 4/1, moist) to white (10YR 9/1 or N 9/0) (10YR 8/1, moist), and in places it grades to brownish yellow and red; very weak, medium and coarse, angular and subangular, blocky structure; hard, firm, slightly sticky, slightly plastic; a few fine and medium roots; a few very fine and fine tubular pores; thick, continuous, reddish-brown (5YR 5/4) clay films on main ped surfaces and in large root channels; much very fine mica; white clay is possibly kaolin; red material, pH 4.2; white material, pH 4.6; abrupt, irregular boundary.

R--58 inches, white (10YR 8/1) quartzite; partly weathered and stained yellow (10YR 7/6), yellowish brown (10YR 5/6), reddish yellow (7.5YR 6/6), reddish brown (2.5YR 4/4), and red (2.5YR 5/6); pH 4.0.

In undisturbed areas the O horizon is 1 to 3 inches thick. The A1 horizon is 6 inches thick or less. This horizon ranges from brown to reddish gray, reddish brown, or light brown in color. The content of organic matter is 2.5 to 4 percent, and the base saturation ranges from 35 to 55 percent. The A12 horizon is slightly gritty. The A2 horizon is faint to distinct, and in places it contains reddish-brown splotches of material from the B horizon. It is 1 to 8 inches thick. In places the light-brown A2 horizon becomes less distinct as the soil grades toward Suttler soils. In other places the light-gray and pinkish-gray material in the A2 horizon becomes more distinct. The B2t horizon is mostly reddish yellow or light brown in chromas of 4 to 7 and contains redder clay films. It is clay loam in texture and is gravelly or cobbly in places. Depth to bedrock ranges from 4.5 to 7 feet or more. Where the soil is less well drained, it grades toward Potlatch soils.

The available water capacity is high in Greencreek loam, 5 to 30 percent slopes. Fertility is moderately low. Permeability is moderately slow in the subsoil. Runoff is slow to medium, and the erosion hazard is slight to moderate.

All of this soil is used for producing timber and as wildlife habitat. Capability unit IVe-1; woodland group 1; not used as range.

Gwin Series

The Gwin series consists of shallow, well-drained or somewhat excessively drained, hilly to very steep soils. These soils formed mainly in material weathered from basalt. In the southwestern part of the Area, however, some of the soils formed in material weathered from greenstone or metamorphosed andesitic rock. In places the surface layer formed partly in wind-laid silty material.

These soils are in deep canyons on the slopes that face mainly to the south. Elevation ranges from 1,000 to 4,000 feet. The annual precipitation is 21 to 28 inches, and the average annual temperature is 49° F. The average frost-free season is about 100 to 110 days.

The natural vegetation on these soils consists mostly of bluebunch wheatgrass, annual brome grasses, wild geranium, and arrowleaf balsamroot.

Gwin soils are near Mehlhorn soils in many places. In some areas where many ponderosa pine grow, the soils are transitional to Klicker or Sallyann soils. Areas of the Klicker, Mehlhorn, and Sallyann soils are intermingled with Gwin soils, and each of them is mapped in complexes with Gwin soils.

Gwin soils are used mainly for grazing.

Gwin-Klicker stony loams, 40 to 65 percent slopes (GkE).--Most of this complex is strongly dissected by small intermittent streams that flow mainly westward. More than 50 percent of the mapped areas consist of Gwin soil on south-facing slopes that have a cover of grasses, forbs, and shrubs. The remaining areas consist mainly of Klicker soil on north-facing slopes that have a cover of Douglas-fir and ponderosa pine.

The Gwin soil has a surface layer of brown loam that generally is stony and is about 8 inches thick. The subsoil is brown silt loam and silty clay loam. The Klicker soil has a surface layer of stony loam and rocks crop out on less than 2 percent of the surface, but it otherwise is similar to Klicker rocky silt loam, 40 to 65 percent slopes. A profile typical of the Klicker soil is described under the Klicker series. Following is a typical profile of Gwin stony loam on a slope of 46 percent; under range of grasses and forbs; 85 feet east of road at gate near rock pit and 50 feet east of hawthorn tree in the SW 1/4 of NW 1/4 sec. 36, T. 33 N., R. 4 E.:

A11--0 to 2 inches, dark grayish-brown (10YR 4/2) or brown (10YR 4/3, rubbed) stony loam; very dark brown (10YR 2/2) when moist; moderate, very fine, granular structure to a depth of 1 inch, then weak, medium and thin, platy and weak, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial pores and a few, very fine, tubular pores; pH 6.0; clear, wavy boundary.

A12--2 to 4 inches, dark grayish-brown (10YR 4/2) or brown (10YR 4/3, rubbed) stony loam; very dark brown (10YR 2/2) when moist; moderate, thin, platy structure; plates thicken as depth increases; hard, friable, slightly sticky, slightly plastic; common fibrous and fine roots; common very fine and a few, fine and medium, tubular pores; pH 6.0; clear, wavy boundary.

A13--4 to 8 inches, brown (10YR 4/3) stony silt loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky and moderate, fine and very fine, granular structure; hard, friable, slightly sticky, slightly plastic; common fine and fibrous roots; many, very fine, tubular pores; a few worm channels; pH 6.0; clear, wavy boundary.

B1t--8 to 13 inches, brown (7.5YR 4/3) stony heavy silt loam, (7.5YR 5/3, rubbed), dark brown (7.5YR 2/2) when moist; weak, medium and fine, subangular blocky and weak, medium and fine, granular structure; hard, friable, slightly sticky, slightly plastic; common fine and fibrous roots; many very fine and fine pores and a few, medium, tubular pores; a few, thin, dark-brown (7.5YR 3/2) clay films on peds and in some pores; pH 6.2; clear, wavy boundary.

B21t--13 to 17 inches, brown (7.5YR 4/3) (7.5YR 5/3, rubbed) stony light silty clay loam, dark brown (7.5YR 3/3) when moist; moderate, very fine, subangular blocky structure; very hard, friable, sticky, plastic; a few fibrous and fine roots; many very fine pores and a few, fine and medium, tubular pores; thin and medium, nearly continuous, brown (7.5YR 4/3) clay films on peds and in some pores, dark brown (7.5YR 3/3) when moist; pH 6.0; clear, wavy boundary.

B22t--17 to 18 inches, brown (7.5YR 4/3) (7.5YR 5/4, rubbed) very stony silty clay loam, dark brown (7.5YR 3/4) (7.5YR 4/3, rubbed) when moist, in cracks and depressions of rock; about 80 percent is basalt stones; weak, very fine, subangular blocky structure; very hard, firm, sticky, plastic; a few fine roots; a few, very fine, tubular pores; medium, nearly continuous, reddish-brown (5YR 4/3) clay films on peds and in pores, dark reddish brown (5YR 3/3) when moist; pH 6.0 next to bedrock; abrupt, irregular boundary.

R--18 inches, very dark gray (N 3/0) and gray (10YR 5/1) basalt bedrock that generally is weathered to a depth of less than 1 millimeter but is weathered to a greater depth in

places; coated brown (7.5YR 4/3), yellowish-red (5YR 5/6), and reddish-brown (5YR 5/4) in cracks; thick, continuous, reddish-brown (5YR 4/3) clay films in some cracks; pH 5.9.

The A1 horizon is 4 to 10 inches thick. Depth to bedrock ranges from 10 to 20 inches. These soils generally are stony throughout. Basalt rock crops out in a few places.

Included with this unit in mapping are small areas of Mehlhorn stony loam. Also included are small areas of soils that have a cobbly subsoil but otherwise are similar to Gwin soils. Other included soils have a cobbly silty clay loam subsoil.

Available water capacity is low in this soil above bedrock. Permeability is moderately slow in the subsoil. This soil is somewhat excessively drained. Fertility is moderate. Runoff is very rapid, and the erosion hazard is very severe.

Most of the Gwin soil in this complex is used for grazing livestock and big game. The Klicker soil is used mainly for producing timber and as summer range for big game. Both parts, capability unit VIIe-1; Gwin part, South Slope range site, not used as woodland; Klicker part, woodland group 4, not used as range.

Gwin-Mehlhorn stony loams, 12 to 45 percent slopes (GmD).--This complex is about 45 to 65 percent shallow Gwin stony loam and about 25 to 45 percent moderately deep Mehlhorn stony loam. The Gwin soil is not so steep as the Gwin soil in Gwin-Klicker stony loams, 40 to 65 percent slopes, but otherwise it is similar. The Mehlhorn soil has a stony surface layer, and is less steep than the Mehlhorn soil in Mehlhorn-Gwin loams, 25 to 45 percent slopes, but otherwise it is similar. Included in mapping and making up about 5 to 15 percent of the acreage are unnamed soils that have a subsoil of clay or of gravelly loam. Also included and making up as much as 10 percent of the acreage are areas where basalt rock crops out or the soil is less than 6 inches deep to rock. In most places angular basalt stones, 10 to 15 inches in diameter, are 10 to 100 feet apart on the surface. A few to common stone fragments smaller than these generally are on and in the soils.

Available water capacity is about 2 or 3 inches in the Gwin soil, and about 4 to 7 inches in the Mehlhorn soils. In both soils drainage is good, runoff is medium to rapid, and the erosion hazard is moderate to severe.

This complex is used for grazing by livestock and big game. Where desirable, most areas can be cultivated sufficiently to reseed grasses. Capability unit VIe-2; Loamy range site; not used as woodland.

Gwin-Mehlhorn stony loams, 45 to 65 percent slopes (GmE).--This complex is about 55 to 75 percent shallow Gwin stony loam and about 15 to 35 percent is moderately deep Mehlhorn stony loam. The Gwin soil is similar to the Gwin soil in Gwin-Klicker stony loams, 40 to 65 percent slopes. The Mehlhorn soil has a stony surface layer and is steeper than the Mehlhorn soil in Mehlhorn-Gwin loams, 25 to 45 percent slopes, but otherwise it is similar. In as much as 15 percent of the acreage, rocks crop out and the soils are less than 5 inches deep to rock. Included in mapping with this unit are a few small areas of a soil that has a clayey subsoil. In most places angular basalt stones, 10 to 15 inches in diameter, are 5 to 100 feet apart on the surface. A few to common stone fragments smaller than these generally are on and in the soils.

The available water capacity is 2 to 3 inches in the Gwin soil, and 4 to 7 inches in the Mehlhorn soil. In both soils drainage is somewhat excessive, runoff is very rapid, and the erosion hazard is very severe.

This complex is used for grazing by livestock and big game. Because of the very steep slopes, it is not feasible to use on these soils the large equipment needed for reseeding. Capability unit VIIe-1; South Slope range site; not used as woodland.

Gwin-Sallyann stony loams, 35 to 65 percent slopes (GsE).--This complex is in the southern part of the survey area, where the soils formed in material weathered from greenstone, metamorphosed andesite, and related rock. It is about 50 to 70 percent shallow Gwin stony loam and about 20 to 40 percent moderately deep Sallyann stony loam. The Gwin soil, on slopes that face south and west, is similar to the Gwin soil in Gwin-Klicker stony loams, 40 to 65 percent slopes. The Sallyann soil, on slopes that face north, is similar to the typical Sallyann soil described under the Sallyann series. The Gwin soil has a cover of bunchgrasses and associated plants. On the Sallyann soil the vegetation is chiefly Douglas-fir and ponderosa pine, though grand fir grows in places.

Available water capacity is about 2 or 3 inches in the Gwin soil, and 4 to 7 in the Sallyann soil. In both soils drainage is somewhat excessive, runoff is rapid to very rapid, and the erosion hazard is severe to very severe.

This complex is used mostly for grazing by big game and livestock. Both parts capability unit VIIe-1; Gwin part, South Slope range site, not used as woodland; Sallyann part, not used as range, woodland group 4.

Helmer Series

The Helmer series consists of deep and very deep, well-drained soils on uplands. These soils formed mainly in silty wind-laid material. In some places, however, the upper layers contain volcanic ash, and in a few places the lower part of the soil formed in material weathered from basalt rock.

Elevation ranges from 2,500 to 5,000 feet, and the annual precipitation is 30 to 40 inches. The average annual soil temperature is about 45° F., and the frost-free season is 50 to 90 days.

The vegetation on these soils is mostly woodland of grand fir, western redcedar, western white pine, Douglas-fir, and western larch. The understory

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consists of golden thread, myrtle boxleaf, twinflower, and associated plants.

These soils are next to or near Brody soils. They are used for small grains, hay, pasture, and woodland.

Helmer silt loam, 0 to 7 percent slopes (HeA).--Most areas of this soil are on broad ridges. Up to 2 1/2 inches of organic matter has accumulated on the surface of this soil. Below is about 11 inches of brown or yellowish-brown silt loam. At a depth of about 11 to 13 inches is pinkish-gray to light-brown silt loam. This material is underlain by brown light silty clay loam.

Typical profile on a nearly level, broad ridgetop north of Glenwood; under western redcedar, grand fir, Douglas-fir, western white pine, and western larch; 200 feet north of road and 200 feet east of gate in SE 1/4 of SW 1/4 sec. 21, T. 34 N., R. 5 E.:

O11--2.5 inches to 2 inches, undecomposed and slightly decomposed needles, leaves, cones, and twigs; pH 5.4; abrupt, irregular boundary.

O12--2 inches to 0, matted moderately decomposed needles, leaves, cones, and pieces of wood; fungi in places; pH 5.2; abrupt, irregular boundary.

B21ir--0 to 6 inches, brown (7.5YR 5/4) silt loam, dark brown (7.5YR 3/4) when moist; contains some very coarse sand and a few, hard, very fine pebbles of weathered basalt; weak, very fine, crumb structure; soft or slightly hard, very friable, slightly sticky, nonplastic; many fine roots and common medium and coarse roots; many micro interstitial pores and common, very fine, tubular pores; common, semihard and hard concretions less than 1 millimeter in diameter; pH 5.6; clear, wavy boundary.

B22ir--6 to 11 inches, similar to the material in the B21ir horizon except color is slightly lighter and boundary is abrupt and wavy.

A'2--11 to 13 inches, light-brown (7.5YR 6/3) silt loam, dark brown (7.5YR 4/3) when moist; a few medium, faint, brown (10YR 5/3) mottles, dark brown (7.5YR 3/3) when moist; weak, very coarse, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine and medium roots; many micro discontinuous tubular pores and many, very fine, continuous, tubular pores; many soft, dark reddish-brown and black concretions less than 0.5 millimeters in diameter and a few, semihard, black concretions less than 1 millimeter in diameter; a few pockets of light silty clay loam; pH 5.8; clear, wavy boundary.

B&A'--13 to 20 inches, mostly brown (7.5YR 5/3) heavy silt loam, dark brown (7.5YR 4/3) when moist; very weak, medium and coarse prismatic and weak, very coarse, subangular blocky structure; prisms and blocks thickly coated with partly bleached, light brownish-gray (10YR 6/2) silt loam A'2 material, brown (7.5YR 4/2) when moist; similar material in pockets, splotches, streaks, and fine lenses inside peds; very hard, firm, slightly brittle, sticky, slightly plastic; a few fine and medium roots; common very fine and a few fine tubular pores; moderately thick clay films coat some discontinuous tubular pores, and the edges of the films protrude from a broken ped; clay films appear fresh and contain no bleached silt; surfaces are smooth but silt grains are visible; many reddish-brown and some black soft and semihard concretions less than 1 millimeter in diameter, a few 1 to 2 millimeters in diameter; pH 5.6; gradual, wavy boundary.

B'x--20 to 30 inches, mostly brown (7.5YR 5/4) light silty clay loam, dark brown (7.5YR 4/3) when moist; very weak, medium and coarse prismatic and weak, coarse and very coarse, subangular blocky structure; very hard, firm, sticky, plastic; a few fine and medium roots; common very fine and a few fine, tubular pores; medium or thick, continuous, reddish-brown (5YR 4/4) clay films in channels (5YR 4/3) when moist, which are fresh and contain no bleached silt; thin, patchy clay films on peds, which contain bleached silt grains and appear to be breaking down; bleached, light-gray (10YR 7/2), silt coatings, dark grayish brown (10YR 4/2) when moist, that are 1 millimeter thick on main vertical surfaces of peds and thinner coatings on minor ped surfaces and in streaks and small splotches; common, soft, reddish-brown and black concretions less than 1 millimeter in diameter and a few, hard, black and reddish-brown concretions 1 to 2 millimeters in diameter; a few, small, black, manganese stains on vertical surfaces; pH 5.6; gradual, wavy boundary.

B'21t--30 to 58 inches, brown (7.5YR 5/3, interior of peds) light silty clay loam, dark brown (7.5YR 4/4) when moist; moderate or weak, medium and coarse, subangular blocky structure; very hard, firm, sticky, slightly plastic; a few fine and medium roots; common very fine and a few, fine, medium, and coarse, tubular pores; thick, continuous, reddish-brown (5YR 4/4 and 5/4) clay films in channels and medium patchy ones on vertical surfaces of peds, dark reddish gray (5YR 4/2) when moist; moderately thick, bleached, light brownish-gray (10YR 7/2) silt coatings on main vertical surfaces and in some channels that are less numerous than in B'x horizon and are brown (7.5YR 4/3) when moist; common, soft, reddish-brown and black concretions less than 1 millimeter in diameter, and a few, hard, black and reddish-brown concretions 1 to 2 millimeters in diameter; a few to common, black, manganese stains; pH 5.5; clear, wavy boundary.

B'22t--58 to 66 inches, light-brown (7.5YR 6/3,

interior of peds) light silty clay loam, brown or dark brown (7.5YR 4/3) when moist; weak or moderate, medium and coarse, subangular blocky structure; very hard, firm, sticky, plastic; a few fine roots; many very fine and fine and a few, medium and coarse, tubular pores; thick and medium, continuous, reddish-brown (5YR 4/3 and 4/4) clay films in channels and on main vertical surfaces of peds that are dark reddish brown (5YR 3/3) when moist and are more numerous than in B'21t horizon; moderate to thin, bleached silt coatings on vertical surfaces and in some channels; some clay films have little or no bleached silt on them; common, soft, reddish-brown and black concretions less than 1 millimeter in diameter, and a few hard, black and reddish-brown concretions 1 to 2 millimeters in diameter; a few, black, manganese stains; pH 5.4.

The O horizon is lacking in cultivated areas. The Bir horizon ranges from 8 to 15 inches in thickness. Depth to light silty clay loam that is brittle and has prismatic and blocky structure ranges from 12 to 20 inches. The fragipan is distinct to weak. Bedrock is at a depth of 4 to 10 feet. Reaction in this soil is strongly acid to medium acid.

Permeability is slow in Helmer silt loam, 0 to 7 percent slopes. Available water capacity is high. Fertility is moderate. Runoff is medium to rapid, and the erosion hazard is moderate to severe. Early in spring the material above the light silty clay loam in the subsoil is saturated.

About 60 percent of this soil is cultivated, and the rest is woodland. Small grains, clovers, and grasses are the principal crops. Alfalfa is grown in some areas, but the soil is not well suited to it. Capability unit IVe-1; woodland group 7; not used as range.

Helmer silt loam, 7 to 12 percent slopes (HeB).--Runoff is medium to rapid on this soil, and the hazard of water erosion is severe. In places gullies form where water collects in unprotected fields. Included with this soil in mapping are small areas of Caribel soils.

About 40 percent of the acreage of this soil is cultivated, and the rest is woodland. Small grains, clovers, and grasses are the principal crops. Alfalfa is grown in some areas, but the soil is not well suited to it. Capability unit IVe-1; woodland group 7; not used as range.

Helmer silt loam, 12 to 25 percent slopes (HeC).--Runoff is medium to rapid on this soil, and the hazard of water erosion is severe. In places gullies form where water collects on unprotected fields.

About 20 percent of this soil is cultivated, and the rest is woodland. This soil is better suited to hay or pasture than to other uses. Capability unit IVe-1; woodland group 7; not used as range.

Helmer silt loam, 25 to 45 percent slopes (HeD).--This soil is mainly on upper parts of canyons. It contains a small amount of coarse sand and fine rock fragments. Depth to bedrock commonly is 3 1/2 to 6 feet.

Runoff is rapid on this soil, and the erosion hazard is severe in areas that are not adequately protected by vegetation.

Because of the erosion hazard, only a very small acreage of this soil is cultivated. This soil is best suited to woodland. Capability unit VIe-1; woodland group 7; not used as range.

Helmer Series, Loamy Variant

Soils of the Helmer series, loamy variant, are undulating to hilly, very deep, and well drained. They are on high ridgetops and benches near the tops of plateaus and mountains. These soils formed in material weathered mainly from the underlying bedrock or from landslide material, chiefly gneiss, mica-schist, granite, quartz monzonite, or other acidic rock. The thin surface layer formed in wind-laid silty material.

Elevation ranges from 3,800 to 5,200 feet, and the average annual precipitation ranges from about 30 to 40 inches. Soil temperatures are colder than in most other soils in the Area.

The natural vegetation is mostly grand fir, but western redcedar, western larch, and Douglas-fir grow in places. The understory is sparse and consists mostly of huckleberry, mountain maple, snowberry, beargrass, twinflower, ferns, and associated forbs and shrubs.

Soils of this variant are associated with soils of the Jughandle and Molly series. They are used mostly for producing timber.

Helmer silt loam, loamy variant, 5 to 20 percent slopes (HmC).--This is the only variant from the Helmer series mapped in the Area. About 1 to 3 inches of organic material is on the surface of this soil. The upper layers are brown silt loam to a depth of about 11 inches. Below this is about 9 inches of light yellowish-brown loam, which is underlain by reddish-brown, yellowish-red, and mainly red sandy clay loam that contains gravel in places. Below a depth of about 45 inches the material is mainly weak-red gravelly sandy clay loam that contains a large amount of multicolored material weathered from rock. Bedrock is commonly at a depth of more than 60 inches.

Typical profile under grand fir on a ridgetop along the Tahoe Ridge-Pine Knob Road; 5.9 miles east of the Nezperce National Forest boundary line, 75 feet south of road at large dead snag and large stump north of the road; in the NE 1/4 of SW 1/4 sec. 26, T. 32 N., R. 6 E.:

011--2 to 1.8 inches, dark-brown (10YR 3/3), matted, undecomposed and slightly decomposed needles, leaves, cones, and twigs, very dark brown

(10YR 2/3) when moist; slight fungi in spots; pH 5.2; abrupt, wavy boundary.

012--1.7 inches to 0.5 inch, very dark grayish-brown (10YR 3/2), moderately matted, moderately decomposed needles, leaves, cones, and pieces of wood, very dark brown (10YR 1/2) when moist; pH 5.2; abrupt, wavy boundary.

02--0.5 inch to 0, very dark grayish-brown (10YR 3/2), matted well-decomposed organic matter that contains a few needles and woody remains, very dark brown (10YR 1/2) when moist; moderate, very fine, crumb structure; common, fine, medium, and coarse roots; pH 5.0 and 5.2; abrupt, wavy boundary.

B21ir--0 to 4 inches, brown (10YR 4/3) silt loam, dark brown (7.5YR 3/3) when moist; a few, very fine pebbles, mostly angular quartz; moderate, very fine, crumb structure; soft, very friable, slightly sticky, nonplastic; common, fine, and medium roots and a few coarse and very coarse roots; many micro interstitial pores and common, very fine and fine, tubular pores; common, hard, rounded pellets up to 2 millimeters in diameter that are mostly concretions but include a few rock particles; a few streaks of dark material from the 02 horizon; low bulk density; peds very stable in water and some float; pH 5.4; clear, wavy boundary.

B22ir--4 to 11 inches, brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/3) when moist; a few, very fine angular pebbles; moderate, very fine, crumb structure; soft, very friable, slightly sticky, nonplastic; many fine roots and common, medium, and coarse roots, and a few roots 2 inches in diameter; many micro interstitial pores and common, very fine, tubular pores; common, semihard and hard, black pellets that are mostly concretions; peds stable in water; low bulk density; pH 5.5; clear, wavy boundary.

IIA'2--11 to 20 inches, light yellowish-brown (10YR 6/4) loam, brown (10YR 4/3) when moist; about 5 percent is fine, angular, quartz pebbles; weak, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, slightly brittle; a few, fine, medium, and coarse roots; many micro interstitial pores and a few, very fine and fine, tubular pores; a few partly uncoated particles; a few, thin, patchy clay films in channels; moderately micaceous; much quartz; peds slightly stable in water; pH 5.3; abrupt, irregular boundary.

IIB'1t--20 to 26 inches, dominantly reddish-brown (5YR 5/4), fine gravelly sandy clay loam, yellowish red (5YR 4/6) when moist; many strongly weathered, fine, rock fragments; a few coarse splotches and streaks of light-brown (7.5YR 6/4) loam (A2 material) that are brown or dark brown (7.5YR 4/4) when moist; weak, coarse, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; a few, fine, medium, and coarse roots; many very fine and a few, fine and medium, tubular pores; medium patchy clay films in pores and channels and as bridges between grains that are red (2.5YR 4/6) when moist; also streaks of red, common, black, manganese stains; highly micaceous; two krotovinas 2 inches in diameter; pH 5.6; gradual, wavy boundary.

IIB'21t--26 to 31 inches, yellowish-red (5YR 5/6) fine gravelly light sandy clay or coarse sandy clay loam, (5YR 4/6) when moist; contains much weathered fine gravel; weak, coarse, subangular blocky structure; hard, friable, sticky, plastic; a few, fine, medium, and coarse roots; many very fine and a few, fine and medium, tubular pores; medium, patchy, reddish-brown (5YR 4/4) clay films, 5YR 4/4 when moist, on peds and medium and thick continuous clay films in channels and as bridges between grains; a few, black, manganese stains; two krotovinas 2 inches in diameter; pH 5.5; abrupt, wavy boundary.

IIB'22t--31 to 44 inches, mostly red (2.5YR 5/6), angular, fine gravelly heavy sandy clay loam or light sandy clay, red (2.5YR 4/5) when moist; contains many light-gray rock fragments; a few coarse, light brownish-gray (2.5Y 6/2) streaks that are grayish-brown (2.5Y 5/2) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky, plastic; a few fine and medium roots; common, very fine, tubular pores; medium patchy clay films on peds, in pores, and as bridges between grains; a few, black, manganese stains; highly micaceous; pH 5.2; gradual, irregular boundary.

IIB'23t--44 to 56 inches, mostly red (2.5YR 5/6), gravelly sandy clay loam, red (2.5YR 4/6) when moist, and in places redder than this; contains much, strongly weathered, fine gravel; a few, coarse, distinct, strong-brown (7.5YR 5/6) splotches, yellowish-red (5YR 4/6) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky, plastic; a few, fine, medium, and coarse roots; common, very fine, tubular pores; thick continuous clay films on main ped surfaces and in some channels; thin patchy clay films on other peds; a few, black, manganese stains; highly micaceous; pH 5.0 or 5.1; gradual, wavy boundary.

IIB'3t--56 to 74 inches, weak-red (10R 4/4 dry or moist) gravelly sandy clay loam that contains much angular strongly weathered rock material of various colors; weak, very fine, subangular blocky structure; hard, friable, slightly sticky, plastic; a few fine and medium roots; common, very fine, tubular pores; a few, black, manganese stains; highly micaceous; pH 5.0 or 4.9.

The 01 horizon is absent in places in areas that were burned or otherwise disturbed. In undisturbed

areas the O horizon generally is underlain by a light-gray bleached layer less than one-half inch thick. The B22ir horizon is slightly gritty. In places the IIB'21t horizon extends to a depth of 34 inches. Reaction of this soil ranges from strongly acid in the upper horizons to very strongly acid in the lower ones.

Fertility is moderately low in Helmer silt loam, loamy variant, 5 to 20 percent slopes. Permeability of the subsoil is moderately slow, and available water capacity is high. The erosion hazard is moderate.

Most of this soil is wooded and is used mostly for producing timber. Capability unit IVe-1; woodland group 7; not used as range.

Jacknife Series

The Jacknife series consists of sloping to steep, very deep, well-drained soils on alluvial and colluvial fans, terraces, and foot slopes of long sides of canyons. These soils formed mainly in water-laid material, in colluvial deposits derived from basalt, and in material weathered from basalt. In places, however, the upper layers formed partly in wind-laid silty material.

Elevation ranges from 1,200 to 2,500 feet. The average annual precipitation is 21 to 26 inches. Vegetation on these soils is mostly bunchgrass, brush, and scattered ponderosa pines.

These soils are strongly acid to slightly acid. In most places basalt pebbles, cobblestones, and other stones occur in various parts of the profile.

In many places on steep canyon sides, Jacknife soils are next to Gwin or Mehlhorn soils. In places on terraces and alluvial fans, Jacknife soils are used for cultivated crops and for range.

Jacknife silt loam, 7 to 12 percent slopes (JaB).--This soil is mainly on local alluvial and colluvial fans in the main canyons of the Clearwater River. The surface layer is about 18 inches of dark-gray silt loam. The subsoil is brown cobbly or stony heavy silty clay or heavy silty clay loam. The upper layers are commonly dark colored to a depth of 20 inches or more.

Typical profile on an alluvial fan in a field under alfalfa on an 11 percent slope that faces east; 2.5 miles south of Stites, west of river, 115 feet west of road, and 55 feet south of ponderosa pine tree on the west edge of the road; in the SW 1/4 of SE 1/4 sec. 32, T. 32 N., R. 4 E.:

Ap--0 to 6 inches, dark-gray (10YR 4/1) silt loam, very dark brown to black (10YR 1/2) when moist; 7 to 10 percent is fine and medium, subangular and angular, basaltic pebbles; weak, medium, platy structure to a depth of 2 inches, and moderate, fine, granular structure below that depth; hard, friable, slightly sticky, slightly plastic; many fine roots and a few medium and coarse roots; many micro interstitial and very fine tubular pores; a few channels as much as 5 millimeters across; pH 5.2; abrupt, smooth boundary.

A11--6 to 10 inches, similar to Ap horizon, except the material is slightly browner and is not platy; clear, wavy boundary.

A12--10 to 18 inches, dark-gray (10YR 4/1) gravelly heavy silt loam, very dark brown (10YR 1/2) when moist; 15 to 20 percent is basaltic subangular pebbles and cobblestones; moderate, fine, subangular blocky to coarse, granular structure; hard, friable, sticky, plastic; common fine and a few medium and coarse roots; many micro interstitial and very fine tubular pores; a few worm channels and casts; pH 5.4; clear, wavy boundary.

B11t--18 to 26 inches, dark grayish-brown (10YR 4/2) gravelly light silty clay loam, very dark brown (10YR 2/2) when moist; 20 percent is angular and subangular, coarse, basaltic pebbles; very weak, medium, prismatic structure that breaks to moderate, fine, subangular blocky; very hard to hard, firm, sticky, plastic; common fine and fibrous roots and a few coarse alfalfa taproots; many very fine pores and common fine and medium pores; thin patchy clay films on peds and in pores; thin bleached coatings on some peds; pH 5.5; clear, broken boundary.

B12t--26 to 36 inches, brown (10YR 5/3) pale-brown (10YR 6/3, rubbed) cobbly heavy silty clay loam, dark brown (10YR 3/3) when moist; 20 to 25 percent is basaltic subangular cobblestones and pebbles; weak, medium, prismatic structure that breaks to strong, fine, subangular and angular blocky; very hard, firm, sticky, plastic; common fine roots, a few medium roots, and a few coarse alfalfa taproots; many, very fine and fine, tubular pores; thin patchy clay films on peds and in channels; peds have a moderately thick coating of bleached silt; clay films frosted; pebbles and cobblestones thickly coated with bleached silt; a few, soft and semihard, black concretions less than 1 millimeter in diameter; pH 5.7; clear, smooth boundary.

B2t--36 to 50 inches, brown (10YR 4/3) cobbly and gravelly heavy silty clay, dark brown (10YR 3/3) when moist; 25 percent is subangular, basaltic cobblestones and pebbles; weak, medium, prismatic structure that breaks to moderate, fine and medium, angular blocky; extremely hard, very firm, sticky, very plastic; common, very fine, fibrous roots, mostly between peds but some inpeds, and a few medium and coarse alfalfa taproots; very dense; a few, fine, tubular pores inpeds; medium, continuous, dark-brown (10YR 3/3) clay films on peds and thick continuous clay films in channels; some pressure faces and slickensides; a few, soft, black concretions 0.5 millimeter to 1.5 millimeters in diameter; pH 5.9; gradual, wavy boundary.

B3t--50 to 56 inches, brown (10YR 4/3) and pale-brown (10YR 6/3), cobbly and gravelly heavy silty clay loam, dark grayish brown (10YR 4/2) and brown (10YR 5/3) when moist; about 10 percent is cobblestones and 15 percent is pebbles that are basaltic and mostly subangular; moderate, fine, subangular blocky structure; hard, firm, sticky, plastic; a few fine roots and a few, medium, alfalfa taproots; a few, very fine, tubular pores; thin patchy clay films; basalt pebbles and cobblestones are moderately weathered; pH 6.1.

The A horizon ranges from 10 to 18 inches in thickness. The B2t horizon is 35 to 50 percent clay and is brown or dark brown in color. Structure in this horizon is weak to moderate prismatic or moderate or strong blocky. Clay films are medium or thick. Basalt fragments increase in number and size with depth. Depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of soil that has slopes of less than 7 percent.

Fertility is moderately high in Jacknife silt loam, 7 to 12 percent slopes. Permeability is slow in the subsoil. The available water capacity is high. Runoff is medium, and the erosion hazard is moderate.

About 60 percent of the acreage of this unit is used for cultivated crops, and the rest is used for grazing. Small grains, peas, lentils, alfalfa, clovers, and grasses are the principal cultivated crops. Capability unit IIIe-1; Loamy range site; not used as woodland.

Jacknife silt loam, 12 to 25 percent slopes (JaC).--This soil is on local alluvial and colluvial fans. Runoff is medium to rapid, and the erosion hazard is moderate.

About 30 percent of the acreage of this soil is used for cultivated crops, and the rest is used for grazing. Farmed areas are better suited to hay and pasture plants than to other crops. Capability unit IVe-1; Loamy range site; not used as woodland.

Jacknife silt loam, 12 to 25 percent slopes, eroded (JaC2).--This soil is on alluvial and colluvial fans. Erosion has removed 2 to 5 inches of the original surface layer, and in places small gullies have formed where water collects. Runoff is medium to rapid on this soil, and the hazard of further erosion is moderate.

About 30 percent of the acreage of this soil is used for cultivated crops, and the rest is used for grazing. Farmed areas are better suited to hay or pasture plants than to other crops. Capability unit IVe-1; Loamy range site; not used as woodland.

Jacknife silt loam, 25 to 45 percent slopes (JaD).--This soil is on alluvial and colluvial fans and on terraces. Runoff is rapid, and the erosion hazard is severe.

Most areas of this soil are grazed. The trees that occur in scattered areas are harvested. Capability unit VIe-2; Loamy range site; not used as woodland.

Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes (JmD).--This complex is on alluvial and colluvial fans and the sides of canyons. About 50 to 70 percent of the acreage is very deep Jacknife silt loam on fans, and about 30 to 50 percent is moderately deep Mehlhorn silt loam on canyon slopes. The Jacknife soil is steeper than Jacknife silt loam, 7 to 12 percent slopes, but otherwise it is similar. Except that the Mehlhorn soil has a silt loam surface layer, it is similar to the Mehlhorn soil in Mehlhorn-Gwin loams, 25 to 45 percent slopes.

Runoff is rapid on these soils, and the hazard of erosion is severe. The soils are well suited to grazing, and most areas are used for that purpose. Capability unit VIe-2; Loamy range site; not used as woodland.

Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes, eroded (JmD2).--This complex is on local alluvial and colluvial fans and the sides of canyons. About 60 percent of the complex is made up of deep Jacknife silt loam on fans, and the remaining 40 percent is moderately deep Mehlhorn silt loam on canyon slopes. The Jacknife soil is steeper than Jacknife silt loam, 7 to 12 percent slopes, but otherwise it is similar. Except that the Mehlhorn soil has a silt loam surface layer, it is similar to the Mehlhorn soil in Mehlhorn-Gwin loams, 25 to 45 percent slopes. Also, from 3 to 5 inches of the original surface layer of these soils have been removed by erosion and small gullies have formed where runoff water collects.

Runoff is rapid on these soils, and the hazard of further erosion is severe. The soils are well suited to grazing, and most areas are used for that purpose. Capability unit VIe-2; Loamy range site; not used as woodland.

Jacknife Series, Loamy Variant

Soils of the Jacknife series, loamy variant, are nearly level to moderately steep, very deep, and well drained. They are on alluvial and colluvial fans and terraces. They formed mainly in water-laid material washed from basaltic material and silty soils. In places, however, material in upper layers formed in wind-laid silty material.

Elevation ranges from 1,000 to 2,500 feet. The average annual precipitation ranges from 21 to 27 inches, and the average annual temperature is about 50° F. The frost-free season ranges from about 130 to 170 days.

The vegetation on these soils is mostly bunchgrasses, forbs, and shrubs, but a few ponderosa pines grow in a few places.

These soils are associated with soils of the Jacknife and Nicodemus series. Most areas are used for cultivated crops and for grazing.

Jacknife silt loam, loamy variant, 0 to 7 percent slopes (JcA).--This soil is on river terraces and alluvial fans at the foot of steep soils in canyons. The surface layer is dark grayish-brown silt loam about 18 inches thick. The subsoil, about 18 inches thick, is brown loam, heavy loam, or heavy silt loam. Bedrock is at a depth of more than 5 feet.

Typical profile on a 3-percent slope in a cultivated field; about one mile south of Indian village and 100 feet west and 100 feet north of the gate post; in the SW 1/4 of SW 1/4 sec. 18, T. 33 N., R. 4 E.:

Ap--0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) when moist; moderate or weak, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial pores; common very fine tubular pores and a few fine tubular pores; a few, white, uncoated grains; very slight mica content; pH 5.4; abrupt, smooth boundary.

A1--7 to 18 inches, dark grayish-brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) when moist; moderate or weak, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fibrous and fine roots; many micro interstitial pores; common very fine tubular pores and a few fine tubular pores; a few, white, uncoated grains; slight mica content; compact plow sole at depth of about 10 inches; a more clayey horizontal layer about 0.25 inch thick at depth of about 12 inches; pH 5.6; clear, wavy boundary.

B1t--18 to 26 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak or moderate, medium and fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fibrous and fine roots; many, very fine and fine, tubular pores; a few thin clay films in channels; pH 5.8; abrupt, wavy boundary.

B2t--26 to 28 inches, brown (10YR 5/3) heavy loam, dark brown (10YR 3/3) when moist; moderate, fine and medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; a few fine roots; many very fine tubular pores and a few, fine, tubular pores; thin, patchy, dark grayish-brown (10YR 4/2) clay films on peds and in channels, very dark brown (10YR 2/3) when moist; one or a few, more clayey, horizontal layers 1 to 2 inches or less thick; pH 5.8; abrupt, wavy boundary.

B3t--28 to 36 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, fine and medium, subangular blocky structure; hard, friable, slightly plastic; a few fine roots; many very fine tubular pores and a few, fine, tubular pores; thin, patchy, brown (10YR 5/3) clay films on peds and in channels, dark brown (10YR 3/3) when moist; pH 6.0; clear, wavy boundary.

IIC--36 to 62 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; contains a few fine pebbles; massive; slightly hard, very friable, slightly sticky, slightly plastic; no roots; common, very fine, tubular pores; pH 6.2.

The dark grayish-brown A1 horizon is about 3.5 to 4.5 percent organic matter. The dark upper horizons have a color value of less than 5.5 when dry and less than 3.5 when wet and are more than 1 percent organic matter to a depth of at least 20 inches. The B2t horizon is 22 to 27 percent clay. In places this horizon is gravelly or cobbly, has moderate subangular blocky structure, or weak or moderate prismatic structure, and has thin or medium patchy clay films or nearly continuous clay films on the peds. Reaction in the solum ranges from slightly acid to strongly acid. No carbonates are within 5 feet of the surface.

The available water capacity is high in Jacknife silt loam, loamy variant, 0 to 7 percent slopes. Permeability is moderate in the subsoil. Runoff is slow, and the erosion hazard is slight.

About 85 percent of the acreage of this soil is used for homesites and cultivated crops. The rest is pastured. Small grains, vegetable crops, peas, lentils, clovers, alfalfa, and grasses are the principal crops. Capability unit IIe-1; Loamy range site; not used as woodland.

Jacknife silt loam, loamy variant, 7 to 12 percent slopes (JcB).--This soil is on alluvial fans on the edges of river terraces. Runoff is medium, and the erosion hazard is moderate.

About 85 percent of the acreage of this soil is used for homesites and cultivated crops. The rest is pastured. Small grains, vegetable crops, peas, lentils, clovers, alfalfa, and grasses are the principal crops. Capability unit IIIe-1; Loamy range site; not used as woodland.

Jacknife silt loam, loamy variant, 12 to 25 percent slopes (JcC).--This soil is on alluvial and colluvial fans below steep sides of canyons. The erosion hazard is moderate. Operating heavy equipment on this soil is more difficult than on Jacknife silt loam, loamy variant, 0 to 7 percent slopes.

About 50 percent of the acreage of this soil is used for cultivated crops. The rest is used for pasture. Not so many vegetable crops are grown on this soil as on Jacknife silt loam, loamy variant, 0 to 7 percent slopes, but the crops grown otherwise are similar. Capability unit IIIe-1; Loamy range site; not used as woodland.

Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded (JcC2).--This soil is on alluvial and colluvial fans below steep sides of canyons. In more than half the acreage, from 3 to 7

inches of the original surface layer has been removed by erosion. The soil in the rest of the acreage, however, is only slightly eroded. In places where water collects and runs downhill, small shallow gullies have formed. Runoff is medium, and the hazard of further erosion is moderate.

Included with this soil in mapping are small areas of Jacknife soils that have slopes up to 45 percent.

About 50 percent of the acreage of this soil is used for cultivated crops; the rest is used for pasture. Not so many vegetable crops are grown on this soil as on Jacknife silt loam, loamy variant, 0 to 7 percent slopes, but the crops grown otherwise are similar. Capability unit IIIe-1; Loamy range site; not used as woodland.

Jughandle Series

In the Jughandle series are very deep and deep, somewhat excessively drained, hilly to very steep soils on mountains and uplands. These soils formed in material weathered from granite, quartz monzonite, gneiss, and mica-schist.

Elevation ranges from 3,300 to 6,000 feet. The average annual precipitation is 30 to 42 inches, and the average annual temperature is about 40° F. The frost-free season is 10 to 80 days long.

Vegetation on soils of this series consists mostly of grand fir, western redcedar, western white pine, western larch, and Douglas-fir. The sparse understory is made up of snowberry, thimbleberry, huckleberry, thalictrum, myrtle boxleaf, beargrass, pinegrass, and associated forbs and shrubs.

These soils are strongly acid to slightly acid.

In the northern part of the Area, the Jughandle soils are next to Molly soils. At lower elevations Jughandle soils are associated with Suttler soils.

These soils are used for producing timber and as summer range for big game.

Jughandle sandy loam, 35 to 65 percent slopes (JuE).--The upper layers of this soil are brown or light yellowish-brown sandy loam or coarse sandy loam. They are soft or very friable, and have crumb structure. Gravelly sandy loam to gravelly loamy coarse sand is at a depth below about 16 inches.

Typical profile under western redcedar, Douglas-fir, and grand fir on a 58 percent slope that faces east; 5 miles north of April Creek road intersection along Cedar Creek road and 100 feet west of lookout sign at end of road; in the NW 1/4 of NE 1/4, sec. 27, T. 35 N., R. 6 E. (Profile 60-Ida-25-10 sampled for laboratory analysis):

01--1 to 0.8 inch, undecomposed and slightly decomposed needles, cones, and twigs; pH 5.8.

012--0.8 inch to 0, partly decomposed and well-decomposed needles, cones, twigs, leaves, and pieces of wood; pH 5.5; abrupt, wavy boundary.

B21ir--0 to 5 inches, brown (10YR 5/3 to 7.5YR 5/3) sandy loam, dark brown (10YR 3/3 to 7.5YR 3/3) when moist; about 10 percent is angular and subrounded pebbles mostly less than 5 millimeters in diameter; weak, very fine, crumb structure; soft, very friable, slightly sticky, nonplastic; many fine and medium and common coarse roots; many micro interstitial and very fine tubular pores; a few dark sand grains; a few light yellowish-brown pellets 2 to 4 millimeters in diameter; pH 5.8, clear, smooth boundary.

B22ir--5 to 16 inches, light yellowish-brown or brown (10YR 6/4 to 10YR 5/3) sandy loam, dark brown (7.5YR 3/4) or dark yellowish brown (10YR 3/4, rubbed) when moist; about 5 percent is subrounded and angular gravel less than 5 millimeters in diameter; weak, very fine, crumb structure; soft, very friable, slightly sticky, nonplastic; many fine and medium roots and common coarse and very coarse roots; many micro interstitial and very fine tubular pores; pH 6.1; clear, irregular boundary.

C1--16 to 30 inches, pale-brown (10YR 6/3) light coarse sandy loam, brown (10YR 4/3) when moist; about 10 percent is very fine gravel; massive; soft, very friable, slightly sticky, nonplastic; common fine and medium roots; many micro interstitial pores and common, very fine, tubular pores; a few, more clayey, brown (7.5YR 5/4), horizontal bands 0.2 inch thick, dark brown (7.5YR 4/4) when moist; some streaks and spots of material from B22ir horizon; moderately micaceous; pH 5.8; clear, wavy boundary.

C2--30 to 58 inches, very pale brown (10YR 8/3), fine, gravelly light loamy coarse sand, pale brown (10YR 6/3) when moist and crushed; about 40 percent is fine gravel, massive; slightly hard, friable, nonsticky, nonplastic; a few fine and medium roots; many micro interstitial pores; moderately micaceous; several more clayey, wavy, horizontal, reddish-brown (5YR 5/4) bands 3 to 5 millimeters thick that are slightly darker when moist; pH 5.6; gradual, irregular boundary.

C3--58 to 68 inches, very pale brown (10YR 8/3) sand; slightly weathered granite gneiss or hornblende-biotite gneiss; pale brown (10YR 6/3) when moist and crushed; pH 5.4.

The 0 horizon is about 2 inches thick, but in places it is lacking where the soil has been burned over or disturbed. In undisturbed areas a thin discontinuous A2 horizon is between the 0 and B2ir horizons. The B2ir horizon is about 16 inches thick and has crumb structure. Reaction is strongly acid to slightly acid in this soil. Slightly weathered bedrock is at a depth of 40 to 70 inches.

Included with this soil in mapping are small areas of soil less than 40 inches deep.

The available water capacity is moderate in Jughandle sandy loam, 35 to 65 percent slopes.

Permeability is moderately rapid. Fertility is moderately low. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe where vegetative cover or litter is lacking.

Nearly all of this soil is used for producing timber and as summer range for big game. The soil is well suited to these uses. Capability unit VIIe-1; woodland group 8; not used as range.

Jughandle sandy loam, 12 to 35 percent slopes (JuD).--This soil is on uplands. Runoff is slow to medium, and the erosion hazard is moderate.

Nearly all of this soil is used for producing timber and as summer range for big game. The soil is well suited to these uses. Capability unit VIe-1; woodland group 8; not used as range.

Klicker Series

The Klicker series consists of deep, well-drained, hilly to very steep soils on mountains and hills and on the sides of steep canyons. Most slopes face north, but in places at high elevations they face south. These soils formed mainly in material weathered from basalt. In places, however, the surface layer formed partly in silty wind-laid material.

Elevation ranges from 2,000 to 4,000 feet. The average annual precipitation is 21 to 28 inches. The average annual temperature is about 46° F., and the frost-free season is 70 to 120 days.

The vegetation on soils of this series consists mainly of Douglas-fir, ponderosa pine, and a moderate understory of shrubs, forbs, and grasses.

Klicker soils are next to Caribel soils in places on ridges. They are next to Gwin and Mehlhorn soils in places on dry south-facing slopes, where the vegtation is mainly grasses and forbs. Most areas of Klicker soils are used for producing timber and as summer range for big game.

Klicker rocky silt loam, 40 to 65 percent slopes (KcE).--This soil is on mountains and on canyon sides. Most slopes face north, but at high elevations some slopes face south.

A thin cover of organic material is on the surface of this soil. The surface layer is about 6 inches of brown to dark-brown silt loam. The subsoil is brown cobbly or gravelly silty clay loam, heavy silt loam, or heavy loam. Moderately or strongly weathered basalt bedrock is at a depth of about 39 inches. Outcrops of basalt cover about 2 to 10 percent of the surface.

Typical profile on a 54 percent slope that faces east under Douglas-fir, grand fir, and ponderosa pine; north of Clearwater on the west side of the canyon; on old logging road, 3,240 feet north of gate on gravel road; 600 feet north of car turnaround on west side of road; in the NW 1/4 of SE 1/4 sec. 7, T. 31 N., R. 5 E.:

O1--0.5 inch to 0, very slightly decomposed needles, cones, leaves, and twigs; pH 5.5; abrupt, wavy boundary.

A1--0 to 3 inches, brown to dark-brown (7.5YR 4/2) silt loam, very dark brown (7.5YR 2/2) when moist; about 1 percent is basaltic gravel; strong, fine and medium, granular structure; hard granules; very friable, slightly sticky, slightly plastic; many fibrous, fine, and medium roots and a few very coarse roots; many micro interstitial pores; a few uncoated grains of silt; pH 5.8; clear, wavy boundary.

A3--3 to 6 inches, brown (7.5YR 4/2) silt loam, very dark brown (7.5YR 2/2) when moist; about 1 percent is basalt gravel; very weak, medium, subangular blocky and moderate, fine and medium, granular structure; hard, very friable, slightly sticky, slightly plastic; many roots; many micro interstitial pores and common very fine and fine tubular pores and a few, medium, tubular pores; a few worms, worm channels, and casts; a few uncoated silt grains; pH 5.9; clear, wavy boundary.

B1t--6 to 19 inches, brown (7.5YR 4/3) heavy silt loam, dark brown (7.5YR 3/2) when moist; weak, medium, subangular blocky and moderate, fine, granular structure; hard, friable, slightly sticky, slightly plastic; many roots; many micro interstitial pores; many very fine tubular pores and common, fine and medium, tubular pores; a few krotovinas as large as 4 inches in diameter; a few uncoated silt grains; a few thin clay films in pores; pH 5.9; clear, wavy boundary.

B21t--19 to 30 inches, brown (7.5YR 5/3) cobbly and gravelly light silty clay loam, brown when moist; about 55 or 60 percent is basaltic, weathered, coarse fragments of subangular and angular, light-gray (5Y 6/1) pebbles and cobblestones; weak, medium, subangular blocky structure; hard, friable, sticky, plastic; common fibrous and fine roots and a few medium roots; many, very fine, tubular pores; a few thin patchy clay films on peds and medium, nearly continuous, brown (7.5YR 5/4) clay films in many pores; a few bleached silt grains on some peds; black manganese stains on some pebbles; pH 5.6; clear, wavy boundary.

B22t--30 to 33 inches, brown (7.5YR 5/3), cobbly and very gravelly silty clay loam, dark brown (7.5YR 4/3) when moist; 60 to 80 percent is subangular and angular pebbles and cobblestones that are light olive gray (5Y 6/2) and moderately weathered; moderate, fine, subangular blocky structure; very hard, firm, sticky, plastic; a few fine and medium roots; a few, very fine and fine, tubular pores; thin, nearly continuous, brown (7.5YR 4/3) clay films on peds and medium continuous clay films in pores, dark brown (7.5YR 3/2) when moist; moderate, black, manganese stains in some cracks in the basalt; pH 5.5; clear, irregular boundary.

B23t--33 to 39 inches, well-decomposed, light-gray (5Y 7/1) basalt bedrock that has brown (7.5YR 5/3) cobbly and very gravelly silty

clay loam, dark brown (7.5YR 4/3) when moist, in cracks, thick, continuous, reddish-brown (5YR 4/3) clay films on some basalt fragments; a few vesicles lined with yellow (2.5Y 7/6) in the basalt; common, black, manganese stains in cracks of basalt; the silty clay loam is less than 15 or 20 percent, by volume, of the layer, and the percentage decreases to nearly zero at the bottom; silty clay loam is pH 5.6; decayed rock is pH 6.2; clear, irregular boundary.

R--39 inches, moderately or strongly weathered basalt bedrock that has a little material like that in the B2t horizon in cracks; basalt is pH 6.2; B2t material is pH 5.9.

Generally the O horizon is less than 1 inch thick, but in places it is absent where the soil has been disturbed. The dark A horizon is 4 to 8 inches thick. The angular cobbly and gravelly basalt fragments range from a few to common on and in the upper layers, but make up 35 to 80 percent of the lower layers. Depth to fractured bedrock ranges from 20 to 40 inches in most places.

Available water capacity is moderate on this soil. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe. Permeability is moderate in the subsoil. Fertility also is moderate.

This soil is used mainly for producing timber and as summer range for big game. It is well suited to these uses. The steep slopes, however, make logging difficult. Capability unit VIIs-1; woodland group 4; not used as range.

Klicker rocky silt loam, 12 to 40 percent slopes (KcD).--Runoff is medium to rapid on this soil. The erosion hazard is moderate to severe.

Most of this soil is used for producing timber and as summer range for big game. Capability unit VIs-1; woodland group 4; not used as range.

Kooskia Series

The Kooskia series consists of very deep and deep, moderately well drained, nearly level to hilly soils. These soils formed partly in windlaid silty material and partly in material weathered from basalt and other kinds of rock.

These soils are in the western part of the Area on dissected uplands and plateaus. Elevation ranges from 2,000 to 3,300 feet. The average annual precipitation is 24 to 28 inches, and the average annual temperature is about 48° F. The frost-free season is 100 to 130 days long.

The vegetation on soils of this series consists mostly of ponderosa pine, but Douglas-fir grows in places. The understory is made up of pinegrass, Idaho fescue, cheatgrass, wild rose, snowberry, ocean-spray, and other grasses, shrubs, and forbs.

Kooskia soils are next to Klicker soils in places. Most areas of the Kooskia soils are cultivated, but some are used for pasture and woodland.

Kooskia silt loam, 0 to 7 percent slopes (KoA).--This soil is in the western part of the Area on broad ridgetops of plateaus. It is farmed more extensively than any other soil in the Area. Slopes are mostly 2 to 7 percent.

In wooded areas the surface layer is dark grayish-brown silt loam about 9 inches thick. The upper part of the subsoil is brown heavy silt loam to a depth of about 22 inches. The middle part is mottled light brownish-gray silt loam that contains very fine iron-manganese concretions and extends to a depth of about 30 inches. The lower part of the subsoil is brown and pale-brown silty clay and silty clay loam. Basalt bedrock is at a depth of about 72 inches.

Typical profile on a 2 percent convex slope (pl. II) under ponderosa pine, Douglas-fir, grass, and shrubs; 50 feet west of logging road and 440 feet north of gate along gravel road; in the SW 1/4 of NE 1/4 sec. 22, T. 33 N., R. 4 E. (profile 60-Ida-25-34 sampled for laboratory analysis):

O1--0.3 inch to 0, undecomposed needles, leaves, cones, and twigs; pH 5.2; abrupt, wavy boundary.

A1--0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) when moist; weak, very fine, subangular blocky structure and strong or moderate, fine, very fine, and medium, granular structure; hard, friable, slightly sticky, slightly plastic; many fine roots; many micro interstitial pores; a few worm channels and worm casts; a few, uncoated or bleached, white silt grains; a few, dark reddish-brown and yellowish-red, soft concretions less than 1 millimeter in diameter; pH 6.0; clear, wavy boundary.

A3--4 to 9 inches, dark grayish-brown (10YR 4/2) or brown (7.5YR 4/2) silt loam (10YR 5/3, rubbed), very dark brown (7.5YR 2/2) when moist; weak, medium, subangular blocky and moiderate, medium and coarse, granular structure; hard, friable, slightly sticky, slightly plastic; many fine roots, common medium roots, and a few coarse roots; many micro interstitial pores, many, very fine, tubular pores, and a few, fine and medium, tubular pores; a few worm channels and worm casts; a few thin clay films in channels; a few bleached silt grains; a few, reddish-brown and black, soft concretions less than 1 millimeter in diameter; pH 6.0; clear, wavy boundary.

B1--9 to 16 inches, brown (10YR 4/3) heavy silt loam (10YR 5/3, rubbed), very dark brown (10YR 2/3) (10YR 3/3, rubbed) when moist; weak, coarse, prismatic and weak, medium, subangular blocky structure; hard, firm or friable, sticky, plastic; common fibrous and fine roots and a few medium roots; many, very fine, tubular pores; one 3-inch krotovina; thin patchy clay films in channels and a few, thin, patchy clay films on peds; slight bleached silt coating on some

vertical surfaces of prisms; common to few, yellowish-red and black, soft concretions less than 1 millimeter in diameter; mostly silt, but a few coarse and very coarse sand grains; pH 6.0; gradual, wavy boundary.

B2--16 to 22 inches, brown (10YR 5/3) heavy silt loam that contains a few, yellowish-red (5YR 5/6), weathered, very fine pebbles of basalt, and is dark brown (10YR 3/3) when moist; weak, coarse, prismatic and weak, medium and coarse, subangular blocky structure; hard, firm or friable, sticky, plastic; common fine roots and a few medium roots; many, micro interstitial or discontinuous, tubular pores and common, very fine and a few, fine and medium, tubular pores; one 5-inch krotovina; thin or medium, nearly continuous clay films in channels and thin patchy clay films on peds; slight coating of bleached silt on main surfaces; common to few, yellowish-red and black, soft concretions; pH 5.9; gradual, wavy boundary.

A'21--22 to 27 inches, about 60 percent is light brownish-gray (10YR 6/2), pale-brown (10YR 6/3), and light-gray (10YR 7/2) silt loam in pockets, streaks, specks and many fine lenses, which are brown (10YR 4/3) and grayish brown (10YR 5/2) when moist; about 40 percent is brown (10YR 5/3) silt loam that is dark brown (10YR 4/3) when moist, and if rubbed, is pale brown (10YR 6/3) when dry and dark brown (10YR 4/3) when moist; weak, very coarse, subangular blocky structure or massive; hard, friable or firm, slightly sticky, slightly plastic; a few fine and medium roots; common very fine and a few, fine, tubular pores; thin patchy clay films in channels and a few thin clay films on peds; many, soft, reddish-brown concretions less than 1 millimeter in diameter and a few, semihard, black, concretions 1 millimeter in diameter; pH 6.0; gradual, wavy boundary.

A'22--27 to 30 inches, mostly light-gray (10YR 7/2) silt loam that is grayish brown (10YR 5/2) when moist; much of the upper part is pale brown (10YR 6/3) when dry and brown (10YR 4/3) when moist, and if rubbed, is pale brown (10YR 6/3) when dry and brown (10YR 4/3) when moist; very weak, coarse, prismatic structure, hard, friable, slightly sticky, slightly plastic; a few fine and medium roots; a few, very fine, tubular pores; many, soft and hard, black and reddish-brown concretions up to 2 millimeters in diameter; pH 5.7; abrupt, irregular boundary.

B&A'--30 to 34 inches, brown (10YR 5/3) heavy silty clay loam; dark brown (10YR 3/3) when moist; strong, coarse, columnar structure; columns have moderately rounded tops covered with bleached, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; the coating is 10 millimeters thick between the columns in the upper part and decreases to a fraction of a millimeter at a depth about 32 or 33 inches; extremely hard or very hard, extremely firm, very sticky, very plastic; common fine roots in main vertical cracks and a few in peds; a few micro tubular pores in peds; very dense ped surfaces; thick, continuous, brown (7.5YR 4/2) clay films, dark brown (7.5YR 3/2) when moist, on peds and in cracks; many, soft, reddish-brown concretions less than 1 millimeter in diameter and common, hard, black concretions 0.5 to 3 millimeters in diameter; pH 5.0; gradual, wavy boundary.

B'21t--34 to 45 inches, brown (7.5YR 5/3) silty clay; dark brown (10YR 3/3) when moist; weak, very coarse, prismatic structure, strong, very coarse, angular blocky structure, and moderate, medium, angular to subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; common fine roots in main vertical cracks and a few in peds; a few micro tubular pores in peds; very dense, thick, continuous, brown (7.5YR 4/3) clay films on peds and in pores; films dark brown (7.5YR 4/2) when moist; thick, continuous, dark reddish-brown (5YR 3/2) clay films on main vertical surfaces of prisms that are the same color when moist; moderate, black, manganese stains on peds, especially in vertical cracks; a few, black, hard concretions 1 to 2 millimeters in diameter; pH 4.7; gradual, wavy boundary.

B'22t--45 to 53 inches, brown (7.5YR 5/3) silty clay, dark brown (10YR 4/3) when moist; weak, medium, prismatic and strong, medium and fine, angular and subangular blocky structure; extremely hard, very firm, very sticky, very plastic; a few fine roots in vertical cracks; very dense but very fine tubular pores in peds; medium, continuous, reddish-brown (5YR 4/4) clay films, films dark brown (7.5YR 3/3) when moist, on some peds and in all pores; main vertical surfaces of prisms have thick, continuous, dark reddish-brown (5YR 3/3) clay films, (5YR 3/2) when moist; many black (5YR 2/1) manganese stains on vertical surfaces on peds; common, semihard, black concretions; a few spots of bleached silt loam in peds; pH 5.3; gradual, wavy boundary.

IIB'23t--53 to 65 inches, pale-brown (10YR 6/3) heavy silty clay loam, brown to dark brown (10YR 4/3) when moist; about 2 percent is partly decayed basalt fragments up to 3 inches in diameter; weak, medium, prismatic and moderate, fine, angular blocky structure; very hard, firm, sticky, plastic; a few fine roots; a few, very fine, tubular pores; thick continuous clay films in pores; medium, nearly continuous, brown to dark-brown (7.5YR 4/3) clay films on peds that are the same color when moist; bleached silt specks in a few places; common, soft, black, manganese concretions; pH 6.4; gradual, wavy boundary.

IIB'3t--65 to 72 inches, brown (10YR 5/3) silty clay, dark brown (10YR 3/3) when moist; weak, medium, prismatic and strong, medium and fine, angular blocky structure; about 40 percent is rounded and subangular, vesicular, basalt fragments up to 3 feet or more in diameter; interior of fragments is gray to light gray (10YR 6/1), dark gray (10YR 4/1) when moist; slickensides in places; very hard, firm, very sticky, very plastic; a few fine roots in main cracks; a few, very fine, tubular pores; medium continuous clay films on peds, in pores, and on rocks; common manganese coatings on peds; common, soft, black, manganese concretions; pH 6.7; abrupt, irregular boundary.
IIR--72 inches, basalt bedrock.

In areas that have been cultivated, burned, or otherwise disturbed, the O1 horizon is missing or is mixed into the Ap horizon. The A horizon ranges from 6 to 16 inches in thickness and is high in content of organic matter. The A and B horizons are dark grayish brown to brown at a depth ranging between 15 and 24 inches. The bleached A'2 horizon is light gray and light brownish gray and 3 to 10 inches thick. Depth to the B'2t horizon ranges from 18 to 38 inches, but generally is between 22 and 32 inches. Reaction ranges from strongly acid to medium acid in the upper horizons, and from medium acid to neutral in the lower horizons. Depth to bedrock ranges from 3 1/2 to more than 7 feet.

Included with this soil in mapping are areas of a somewhat poorly drained soil in swales and depressions and at the heads of drainageways. This wet soil is shown on the detailed soil map by the standard symbol for wetness. The upper part of the surface layer is less than 10 inches thick. The finer textured part of the subsoil is at a depth of 15 inches or less. Basalt bedrock is at a depth of 15 to 45 inches.

Permeability is slow in Kooskia silt loam, 0 to 7 percent slopes. The available water capacity is high. During wet periods in spring, a perched water table is at a depth of about 22 to 30 inches. Runoff is medium, and the erosion hazard is slight.

This soil is likely to compact if it is worked when wet. Use of heavy farming and logging equipment therefore is restricted from late in spring until early in fall.

About 85 percent of the acreage of this mapping unit is used for crops or pasture. Most of the rest is wooded. The chief cultivated crops are small grains, peas, lentils, alfalfa, clover, and grasses. Capability unit IIIe-1; woodland group 1; not used as range.

Kooskia silt loam, 7 to 12 percent slopes (KoB).--This soil has shorter and steeper slopes than Kooskia silt loam, 0 to 7 percent slopes. The bleached light-gray and light brownish-gray silty layer above the clayey subsoil generally is 3 to 8 inches thick. Depth to basalt bedrock is 3 1/2 to 7 feet.

Runoff is medium on this soil. The erosion hazard is moderate, and most cropped areas are slightly eroded.

About 80 percent of the acreage of this soil is used for crops or pasture, and the rest is woodland. The chief cultivated crops are peas, lentils, alfalfa, clover, small grains, and grasses (pl. III). Capability unit IIIe-1; woodland group 1; not used as range.

Kooskia silt loam, 7 to 12 percent slopes, eroded (KoB2).--Slightly more than half the acreage of this soil is moderately eroded, and the rest is slightly eroded. In the moderately eroded areas, a few inches of the original surface layer has been washed away and plowing has mixed brownish material from the subsoil with the remaining surface layer. As a result, the present surface layer is grayish brown when dry and very dark grayish brown when moist. It generally is 4 to 8 inches thick. The bleached light-gray and light brownish-gray silt layer just above the clayey subsoil is 3 to 8 inches thick. Depth to basalt bedrock ranges from 3 1/2 to 7 feet. In places small gullies or rills have formed.

Runoff is medium on this soil. The hazard of further erosion is moderate.

Nearly all areas of this soil are used for crops or pasture. Small grains, peas, lentils, alfalfa, clover, and grasses, are the chief crops. Capability unit IVe-1; not used as range or woodland.

Kooskia silt loam, 12 to 25 percent slopes (KoC).--This soil has a bleached light-gray and light brownish-gray silty layer that is 2 to 6 inches thick and is above a clayey subsoil. The subsoil contains a little less clay, but otherwise this soil is similar to Kooskia silt loam, 0 to 7 percent slopes. Also, depth to basalt bedrock generally ranges from about 40 to 60 inches. Runoff is medium, and the erosion hazard is severe.

About half the acreage of this soil is cultivated (pl. III) or is used for pasture. Most of the remaining acreage is woodland. Most cultivated areas are slightly eroded. Capability unit IVe-1; woodland group 1; not used as range.

Kooskia silt loam, 12 to 25 percent slopes, eroded (KoC2).--From one-half to two-thirds of the mapped areas of this soil are moderately eroded, and the remaining areas are slightly eroded. In the moderately eroded areas, much of the original surface layer has been washed away and plowing has mixed brown material from the subsoil with the remaining surface layer. The present surface layer therefore is grayish brown when dry and generally is very dark grayish brown when moist. The surface layer is 4 to 8 inches thick. In places small gullies or rills have formed.

Runoff is medium on this soil, and the hazard of further erosion is severe.

Nearly all mapped areas of this soil are used for crops or pasture. Capability unit IVe-1; not used as range or woodland.

Lochsa Series

The Lochsa series consists of steep to very steep, very deep and deep, somewhat excessively drained soils on hills and mountains. These soils formed mainly in material weathered from granite, mica-schist, gneiss, or somewhat similar acidic bedrock.

Elevation ranges from 1,100 to 4,000 feet. The average annual precipitation is 27 to 36 inches, and the average annual temperature is about 50° F. The frost-free season is about 100 to 165 days.

The vegetation on these soils is mostly grand fir and Douglas-fir, but western redcedar, western white pine, western larch, and ponderosa pine grow in places.

Lochsa soils are next to Suttler soils in places in cold areas. Nearly all of Lochsa soils are used for producing timber and as summer range for big game.

Lochsa sandy loam, 25 to 65 percent slopes (LoE).--This soil has long slopes in most places. A thin layer of organic material is on the surface in undisturbed woodland. This layer is underlain by dark grayish-brown to brown sandy loam or coarse sandy loam that extends to a depth of about 13 inches. The subsoil is brown or light olive-brown gravelly coarse sandy loam that extends to a depth of about 35 inches. It is underlain by light olive-brown gravelly coarse sandy loam. Depth to consolidated bedrock is 40 to 80 inches.

Typical profile under grand fir and western redcedar on a 60 percent slope facing northeast, about one-eighth mile south of Lolo Creek, in the NE 1/4 of NE 1/4 sec. 17, T. 34 N., R. 4 E.:

O1--1 inch to 0, slightly decomposed needles, leaves, cones, twigs, and pieces of wood; pH 5.6; abrupt, irregular boundary.

A11--0 to 3 inches, dark grayish-brown (10YR 4/2) sandy loam or coarse sandy loam, very dark brown (10YR 2/2) when moist; about 15 percent is angular fine pebbles; moderate or strong, very fine, granular structure; soft, very friable, slightly sticky, nonplastic; many fibrous and fine roots and common medium and coarse roots; many micro interstitial pores; much fine mica; pH 5.8; clear, wavy boundary.

A12--3 to 8 inches, dark grayish-brown (10YR 4/2) sandy loam or coarse sandy loam, very dark brown (10YR 2/2) when moist; about 15 percent is angular fine pebbles; moderate or strong, very fine, granular structure; soft, very friable, slightly sticky, nonplastic; many fibrous and fine roots and common medium and coarse roots; many micro interstitial pores; much fine mica; pH 5.8; clear, wavy boundary.

A3--8 to 13 inches, brown (10YR 5/3) coarse sandy loam; dark brown (10YR 3/3) when moist; about 15 percent is angular pebbles; very weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; many fibrous and fine roots and common medium roots; many micro interstitial and very fine tubular pores; much fine mica; pH 5.8; clear, wavy boundary.

B1--13 to 24 inches, brown (10YR 5/3) angular gravelly coarse sandy loam or sandy loam, dark brown (10YR 3/3) when moist; contains a few angular cobblestones; very weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common fibrous and fine roots and a few medium roots; many micro interstitial pores and many very fine and a few, fine and medium, tubular pores; one wavy horizontal layer 2 millimeters thick that contains clay and clay films; much fine mica; pH 5.8; gradual, wavy boundary.

B2--24 to 35 inches, light olive-brown (2.5Y 5/3) or brown (10YR 5/3) angular cobbly or gravelly coarse sandy loam, dark brown (10YR 3/3) when moist; very weak, medium, subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common fibrous and fine roots and a few medium roots; many micro interstitial and very fine tubular pores; much fine mica; one wavy, horizontal, more clayey band 2 or 3 millimeters thick; no clay films except in more clayey band; pH 5.8; gradual, wavy boundary.

C1--35 to 46 inches, light olive-brown (2.5Y 5/3) gravelly coarse sandy loam; olive brown (2.5Y 4/3) when moist; massive; slightly hard, very friable, slightly sticky, nonplastic; a few, fibrous, fine and medium roots; many micro interstitial pores and common, very fine, tubular pores; one wavy, horizontal, more clayey band that has thin nearly continuous clay films; much fine mica; pH 5.8; gradual, wavy boundary.

C2--46 to 56 inches, light olive-brown (2.5Y 5/3) angular gravelly coarse sandy loam, olive brown (2.5Y 4/3) when moist; massive; slightly hard, very friable, slightly sticky, nonplastic; a few, fibrous, fine and medium roots and many micro interstitial and common, very fine, tubular pores; thin, wavy horizontal, clayey band that has nearly continuous clay films; much fine mica; some channery fragments of mica schist; pH 5.9; abrupt, irregular boundary.

R--56 to 65 inches, hard mica schist or gneiss bedrock that is moderately decomposed; medium, patchy, brown (7.5YR 4/3) clay films in cracks; pH 5.6.

The A horizon is 10 to 20 inches thick and ranges in texture from coarse sandy loam to fine sandy loam. The content of angular pebbles and cobblestones throughout the profile ranges from 25 percent to a few. Rock crops out in a few places. Depth to consolidated bedrock is more than 48 inches in most places, but it ranges from 40 to 80 inches.

Included with this soil in mapping were a few areas of Lochsa soil that has slopes less than 25 percent.

The available water capacity is moderate in Lochsa sandy loam, 25 to 65 percent slopes. Permeability is moderately rapid in the subsoil. The content of organic matter is moderately high to high, and fertility is moderate. Runoff is medium to rapid, and the hazard of erosion is severe.

Nearly all of this soil is used for timber production and as summer and winter range for big game. Capability unit VIIe-1; woodland group 9; not used as range.

Lochsa soils, 65 to 90 percent slopes (LsF).--About 50 percent of this mapping unit is sandy loam that is about 40 inches deep to bedrock. Most of the rest is extremely rocky sandy loam that has rock outcrops about 10 to 30 feet apart. These extremely rocky areas are indicated on the map by rock outcrop symbols.

Included with these soils in mapping are some small areas that have a surface layer of loam.

Runoff is very rapid on these Lochsa soils, and the erosion hazard is very severe.

These soils are wooded. They are used mainly as summer range for big game and for watershed purposes. The rock outcrops on this soil interfere with the management and harvesting of trees. Capability unit VIIe-1; woodland group 9; not used as range.

Lochsa-Yakus sandy loams, 30 to 65 percent slopes (LuE).--About 40 to 60 percent of the acreage of this complex is deep to very deep Lochsa sandy loam, and about 20 to 40 percent is shallow Yakus sandy loam. The Lochsa soil is on slopes that face north and northeast under vegetation mainly of grand fir and Douglas-fir. It is slightly more sloping than Lochsa sandy loam, 25 to 65 percent slopes, but it otherwise is similar. The Yakus soil is on slopes that face south and southwest under vegetation mainly of bunchgrasses and ponderosa pine. It is less sloping and has a finer textured surface layer than Yakus coarse sandy loam, 40 to 65 percent slopes, but it otherwise is similar.

Included with these soils in mapping are small areas of rock outcrops. Also included are some soils that are very shallow to bedrock.

The Lochsa soil in this complex is used mainly for producing timber, and the Yakus soil is used mainly for grazing. All areas are used as summer and winter range by big game. Both parts capability unit VIIe-1; Lochsa part, not used as range, woodland group 9; Yakus part, Granitic South Slope range site, not used as woodland.

Lochsa-Yakus rocky complex, 30 to 65 percent slopes (LyE).--About 45 to 70 percent of the acreage of this complex is Lochsa sandy loam, and about 20 to 45 percent is Yakus sandy loam. The Lochsa soil occupies slightly concave intermittent drainageways, foot slopes in areas of steep slopes, and smooth uniform slopes. It is slightly more sloping and commonly is in areas of lower precipitation than Lochsa sandy loam, 25 to 65 percent slopes, but it otherwise is similar. The Yakus soil is on exposed windswept ridgetops, on upper parts of slopes, and on spurs and points of ridges that face south. It is less sloping and has a finer textured surface layer than Yakus coarse sandy loam, 40 to 65 percent slopes, but it otherwise is similar.

Included with this soil in mapping, and making up from 2 to 10 percent of the acreage, are outcrops of rock and very shallow soils. Also included are areas that have a few stones on the surface.

The vegetation on the Lochsa soil is mostly ponderosa pine, though Douglas-fir grows in places. The understory is made up of fescue, chess, pinegrass, cheatgrass, ryegrass, lupine, wild rose, ninebark, snowberry, spirea, and associated forbs and shrubs. On the Yakus soil, the vegetation is mostly bunchgrasses and scattered ponderosa pines.

Nearly all of the Lochsa soil is used for producing timber, and much of it is grazed. The Yakus soil is used mainly for grazing. All of the areas serve as winter range for big game and as watershed. Both parts capability unit VIIs-1; Lochsa part, woodland group 5, not used as range; Yakus part, Granitic South Slope range site, not used as woodland.

Mehlhorn Series

The Mehlhorn series consists of moderately deep, well-drained to somewhat excessively drained, hilly to very steep soils. These soils are on uplands. They formed mainly in material weathered from basalt bedrock and its fragments. In places, however, the upper part formed partly in wind-laid silty material.

These soils are at an elevation of 1,100 to 3,300 feet. Most slopes face south or southwest, and many of them are long. The average annual precipitation is about 21 to 26 inches, and the average annual soil temperature is about 51° F. The frost-free season is about 110 to 160 days.

The vegetation on soils of this series is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, balsamroot, bitterbrush, and associated grasses, forbs, and shrubs. In places scattered ponderosa pine, hawthorne, and aspen grow next to forests and near springs or seepage spots.

These soils generally are slightly acid and medium acid, but they range from neutral to medium acid.

Mehlhorn soils are associated with Gwin, Jacknife, and Klicker soils. They are used mostly for grazing by livestock and big game.

Mehlhorn-Gwin loams, 25 to 45 percent slopes (MgD).--About 45 to 65 percent of this complex generally is moderately deep Mehlhorn loam, and about 30 to 55 percent is Gwin loam. The Mehlhorn soil is on the lower and middle parts of the slopes in more or less concave areas and on slight benchlike areas. It is like the Mehlhorn soil described in

Mehlhorn-Gwin loams, 25 to 45 percent slopes. This soil has a surface layer of dark-brown or brown loam about 10 inches thick. The subsoil is dark-brown or brown gravelly clay loam. Fractured basalt bedrock is at a depth of about 28 inches. The Gwin soil lacks stones and is not so steep as the Gwin soil in Gwin-Klicker stony loams, 40 to 65 percent slopes, but otherwise it is similar. It occurs chiefly around rock outcrops and on the upper parts of long slopes and on spurs of small ridges. This soil is dominantly 10 to 20 inches to basalt.

Typical profile of Mehlhorn loam on a 44 percent slope that faces southeast; 300 feet upslope from post marked with an X; in the SE 1/4 of NW 1/4 sec. 14, T. 32 N., R. 4 E.:

A1--0 to 4 inches, dark-brown (10YR 4/3) loam, very dark brown (10YR 2/3) when moist; contains angular basalt fragments, mostly less than 1 inch in diameter; moderate, very fine and fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial pores; slightly acid; clear, wavy boundary.

A3--4 to 10 inches, dark-brown (10YR 4/3) heavy loam, very dark brown (10YR 2/3) when moist; contains angular pebbles; weak, fine, subangular blocky and moderate, fine, granular structure; hard, friable, sticky, plastic; common fibrous and fine roots; many, very fine, tubular pores; slightly acid; clear, wavy boundary.

B21t--10 to 20 inches, dark-brown (10YR 3/3) (10YR 4/3, rubbed) gravelly, light clay loam, dark brown (10YR 3/3, rubbed) when moist; contains angular pebbles and a few cobblestones and other stones; moderate, very fine and fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; a few fibrous and fine roots; many, very fine, tubular pores; thin patchy clay films; slightly acid; gradual, wavy boundary.

B22t--20 to 28 inches, brown (7.5YR 4/2) very gravelly clay loam, dark brown (7.5YR 3/3) when moist; contains many angular basalt pebbles and some angular cobblestones and other stones; moderate, very fine and fine, subangular blocky structure; hard, friable, sticky plastic; a few fine roots; common, very fine, tubular pores; thin, patchy dark-brown (10YR 3/3) clay films; slightly acid; abrupt, irregular boundary.

R--28 inches, fractured basalt bedrock that has soil material between some cracks; slightly acid or medium acid.

The A1 horizon is gritty. It contains angular pebbles and cobblestones or is stony or very stony in places. In places the B horizon is reddish brown, is silty clay loam, and has weak prismatic structure. Depth to bedrock ranges from 20 to 40 inches.

Included with this complex in mapping, and making up from 1 to 15 percent of most mapped areas, are rock outcrops and unnamed soils. Also included are some stony areas.

Fertility is moderately high in the Mehlhorn soil. Permeability is moderately slow, and available water capacity is moderate. Runoff is rapid, and the erosion hazard is severe.

Most of this complex is used for grazing by livestock and big game. Capability unit VIe-2; Loamy range site; not used as woodland.

Mixed Alluvial Land

Mixed alluvial land (Mn) is on bottom lands and on alluvial fans along creeks and rivers. It consists of mixed water-laid deposits that are dominantly sandy but range from sand to sandy loam or loam in texture. Many areas are gravelly and cobbly.

Most areas of this land type are dissected by stream channels. In spring many of the areas are flooded by runoff. Natural drainage ranges from good to poor.

The vegetation on Mixed alluvial land is mostly willows, grasses, and annual weeds. The areas are used mainly as wildlife habitat. Capability unit VIIIw-1; not used as range or as woodland.

Molly Series

The Molly series consists of deep and very deep, well-drained to somewhat excessively drained, hilly to very steep soils. The upper part of these soils formed mainly in wind-laid silty material. The lower part formed mainly in material weathered from granite, gneiss, mica-schist, and other similar micaceous, acidic bedrock.

Elevation of these soils ranges from 3,000 to 5,000 feet. The average annual precipitation is 30 to 40 inches, and the average annual temperature is 42° F. The frost-free season is 60 to 110 days long.

Vegetation on these soils is mainly grand fir and western redcedar, though western white pine, western larch, and Douglas-fir grow in places. The understory is moderate or sparse. It consists mainly of myrtle boxleaf, huckleberry, prince's pine, thalictrum, dogwood, and associated forbs and shrubs.

Molly soils are strongly acid to slightly acid. They are next to Jughandle soils in some places, but in other places they are near Suttler soils. Molly soils are used mainly for producing timber and as wildlife habitat.

Molly loam, 12 to 30 percent slopes (MoC).--This soil is in the uplands on rounded ridgetops. It consists of about 1 to 3 inches of organic material over about 14 inches of yellowish-brown, brown, and light yellowish-brown loam. Below is pale brown,

light yellowish-brown and pale-yellow and light-gray coarse sandy loam that contains a few rock fragments. Below a depth of about 40 inches is white or mostly white coarse sandy loam or loamy sand that contains disintegrated bedrock. Consolidated bedrock generally is at a depth of 40 to 70 inches.

Typical profile of Molly loam on a 29 percent slope that faces north under western redcedar and grand fir; eastward up Nevada Creek Road, 1.4 miles from the junction of Nevada Creek Road and Lolo Creek Road, then south 0.3 mile on April Creek Road and 100 feet east of the road; in the NE 1/4 of NE 1/4 of NE 1/4 sec. 5, T. 34 N., R. 6 E. (profile 60-Ida-25-9 sampled for laboratory analysis):

O11--2 inches to 1 inch, undecomposed needles, leaves, cones, and twigs; pH 5.6.

O12--1 inch to 0, dark-brown (10YR 3/3) and very dark grayish-brown (10YR 3/2), moderately decomposed needles, leaves, cones, and pieces of wood, very dark brown (10YR 2/2) when moist; pH 5.6; abrupt, wavy boundary.

B21ir--0 to 3 inches, yellowish-brown (10YR 5/4) and brown (10YR 5/3), loam, dark yellowish brown (10YR 3/4) and dark brown (10YR 3/3 to 7.5YR 3/3) when moist; very weak, thin, platy and moderate, very fine, crumb structure; soft, very friable, slightly sticky, slightly plastic; many fibrous, fine, and medium roots; many micro interstitial pores; some semihard very dark gray concretions less than 1 millimeter in diameter; pH 6.2; clear, wavy boundary.

B22ir--3 to 14 inches, light yellowish-brown (10YR 6/4) loam or silt loam, dark yellowish brown (10YR 3/4) or dark brown (7.5YR 4/3) when moist; contains a few fine pebbles; moderate, very fine, crumb structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium roots and common coarse roots; many micro interstitial pores and common, very fine, tubular pores; a few yellowish-brown and very dark brown, semihard pellets about 1 millimeter in diameter; pH 6.4; abrupt, irregular boundary.

IIC1--14 to 17 inches, pale-brown (10YR 6/3) coarse sandy loam, brown or dark brown (10YR 4/3) when moist; about 2 percent is fine gravel; weak, medium, subangular blocky structure; slightly hard, friable, faintly brittle; slightly sticky, slightly plastic; common fine and medium roots; many, very fine, discontinuous tubular pores; a few clay films on peds and in channels; moderate content of mica and quartz sand; pH 6.1; clear, irregular boundary.

IIC2--17 to 27 inches, light yellowish-brown (2.5Y 6/3) coarse sandy loam, brown (10YR 4/3) when moist; about 5 percent is fine gravel; weak, medium, subangular blocky structure; slightly hard, friable, very slightly brittle, slightly sticky, slightly plastic; a few fine and medium roots; many, very fine, tubular pores; a few, 1 inch or larger, brown (10YR 4/3 when moist) splotches of loam; thin or medium continuous clay films in channels; much mica; pH 6.0; clear, wavy boundary.

IIC3--27 to 40 inches, pale-yellow (2.5Y 7/3 and 2.5Y 8/3) and light-gray (2.5Y 7/2) sandy loam and weathered disintegrated quartz monzonite or mica-schist, light olive brown (2.5Y 5/3), light yellowish brown (10YR 6/4), and brown (10YR 5/4) when moist; massive; slightly hard, friable, slightly sticky, nonplastic; a few fine and medium roots; many micro interstitial pores and many very fine, discontinuous, tubular pores; a few browner streaks; a few vertical cracks coated with medium, continuous, brown (7.5YR 5/4) when moist, clay films; very micaceous; pH 5.1; gradual, irregular boundary.

IIC4--40 to 60 inches, mostly white (10YR 8/2) coarse sandy loam and weathered quartz monzonite, or mica-schist, light gray (10YR 7/2) and very pale brown (10YR 7/4) when moist; streaks of brown (7.5YR 5/4), dark brown (7.5YR 4/4) when moist; massive; friable, slightly sticky, nonplastic; a few fine and medium roots; thick, continuous, reddish-brown (5YR 4/4) clay films in channels and in main vertical cracks; pH 4/7; diffuse, irregular boundary.

IIC5--60 inches, partly weathered quartz monzonite or mica-schist; coarse sand; pH 4.7.

In areas disturbed or burned, the organic material is lacking on this soil. In many undisturbed areas a light-gray or light brownish-gray A2 horizon less than one-half inch thick occurs immediately below the organic material. The B2ir horizon commonly is loam or silt loam to a depth of 13 to 20 inches, but in places the lower part is sandy loam. This horizon is slightly gritty in places. The C horizon commonly is slightly brittle at a depth between 15 and 25 inches. Depth to consolidated rock ranged from 40 to 70 inches. The upper part of the bedrock is slightly to moderately decomposed.

Molly loam, 12 to 30 percent slopes, is well drained. The available water capacity is moderately high. Permeability of the subsoil is moderately rapid. Runoff is medium, and the erosion hazard is moderate.

Nearly all of this soil is used for producing timber and as summer range for big game. It is well suited to these uses. Capability unit VIe-1; woodland group 10; not used as range.

Molly loam, 30 to 65 percent slopes (MoE).--This soil is in mountainous areas. It is somewhat excessively drained. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe.

Nearly all of this soil is used for producing timber and as summer range for big game. Capability unit VIIe-1; woodland group 10; not used as range.

Nicodemus Series

The Nicodemus series consists of very deep, well-drained, nearly level to sloping soils on bottom lands, low terraces, and alluvial fans. These soils formed in stream deposits made up mostly of material weathered from granite, gneiss, schist, and basalt.

The Nicodemus soils are mainly along major streams, where elevation ranges from 1,100 to 1,400 feet. The average annual precipitation is 21 to 27 inches, and the average annual soil temperature is about 50° F. The frost-free season is 130 to 170 days long.

Vegetation on these soils is mostly bunchgrasses, forbs, shrubs, deciduous trees, and scattered ponderosa pine and Douglas-fir.

Nicodemus soils are next to Jacknife soils in places on alluvial fans and terraces. They are used mostly for homesteads, building sites, gardens, small grains, and pasture.

Nicodemus loam, 0 to 7 percent slopes (NcA).--This soil is mainly on bottom lands and low terraces of the Clearwater River. In most places slopes range from 0 to 3 percent. The surface layer is dark-gray loam to dark grayish-brown fine sandy loam about 22 inches thick. Below is about 8 inches of dark grayish-brown cobbly and gravelly sandy loam. Loose gravel, cobblestones, and sand generally are at a depth of about 30 inches.

Typical profile of Nicodemus loam in level bottom land under pasture, about 2.1 miles south of Stites, 400 feet northwest of Highway 13, in the NE 1/4 of SE 1/4 sec. 32, T. 32 N., R. 4 E.:

A11--0 to 2 inches, dark-gray (10YR 4/1) (2.5Y 4/1, rubbed) loam, black (10YR 2/1, rubbed) when moist; moderate, fine and medium, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many, fibrous, fine, and medium roots; many micro interstitial pores and a few, very fine, tubular pores; moderate very fine mica; pH 5.4; clear, wavy boundary.

A12--2 to 6 inches, dark-gray (2.5Y 4/1) loam, black (10YR 2/1) when moist; weak, medium and coarse, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many, fibrous, fine, and medium roots; many micro interstitial pores, common very fine pores, and a few fine and medium tubular pores; moderate very fine mica; pH 5.4; abrupt, smooth boundary.

A13--6 to 15 inches, dark-gray (2.5Y 4/1) fine sandy loam, black (2.5Y 2/2) when moist; weak, very fine, granular structure; slightly hard, very friable, slightly sticky, nonplastic; common fibrous and fine roots; many micro interstitial pores and many very fine tubular pores; moderate to large amounts of very fine mica; pH 5.4; gradual, wavy boundary.

A14--15 to 22 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam, very dark brown (10YR 2/2) when moist; massive or very weak, very fine, granular structure; slightly hard, very friable, slightly sticky, nonplastic; a few fibrous and fine roots; many micro interstitial pores and many very fine tubular pores; moderate to large amounts of very fine mica; pH 5.6; abrupt, wavy boundary.

IIA15--22 to 30 inches, dark grayish-brown (2.5Y 4/2) cobbly and gravelly sandy loam, very dark grayish brown (10YR 3/2) when moist; about 55 percent is pebbles and cobblestones; massive; soft, very friable, slightly sticky, nonplastic; many micro interstitial pores and many very fine tubular pores; moderate to large amounts of very fine mica; pH 5.8; abrupt, wavy boundary.

IIIC--30 to 60 inches, stratified cobblestones, pebbles, and sand that is less than 10 percent fines, pH 7.0.

The A horizon typically is loam or fine sandy loam, but it is silt loam in some places. This horizon is dark colored to a depth of 20 inches or more and contains a few pebbles. The IIA horizon ranges from fine sandy loam to coarse sandy loam and is gravelly and cobbly. Loose sand, gravel, and cobblestones are at a depth of 24 to 40 inches.

Included with this soil in mapping are small areas of soil that has a IIIC horizon at a depth of less than 24 inches or of more than 40 inches. Also included are some areas of soil that has a cobbly surface layer. These areas are indicated on the detailed soil map by the standard symbol for cobblestones. Also included in mapping are poorly drained areas in swales and depression that are used mostly for pasture. These wet areas have a cover mostly of sedges, rushes, redtop, and willows, though alder and redcedar grow in places. They are indicated on the map by the standard symbol for wetness.

The available water capacity is moderate in Nicodemus loam, 0 to 7 percent slopes. Permeability of the subsoil is moderately rapid. Fertility is moderately high in this soil. Runoff is slow, and the erosion hazard is slight.

About 80 percent of this soil is used for homesteads and for cultivated crops; the rest is pastured. A small part of the acreage is irrigated by sprinklers. Garden vegetables, peas, lentils, small grains, alfalfa, clovers, and grasses are the main crops. Capability unit IIe-1; not used as range or as woodland.

Nicodemus loam, 7 to 12 percent slopes (NcB).--This soil has shorter slopes than Nicodemus loam, 0 to 7 percent slopes. Runoff is medium, and the erosion hazard is moderate.

About 80 percent of the acreage of this soil is used for homesteads, gardens, and small grains; the rest is pastured. Garden vegetables, peas, lentils, small grains, alfalfa, clovers, and grasses are the

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main crops. Capability unit IIIe-1; not used as range or as woodland.

Potlatch Series

The Potlatch series consists of very deep, somewhat poorly drained, nearly level to hilly, mottled soils that have a claypan. These soils formed mainly in water-laid deposits made up mostly of material weathered from granite, gneiss, mica-schist, and related rocks. In some areas the surface layers formed partly in silty wind-laid material.

These soils are in broad swales, depressions, and seepage areas on alluvial fans, terraces, and uplands. Elevation ranges from 2,600 to 3,500 feet. The annual precipitation is 26 to 30 inches, and the average annual soil temperature is about 48° F. The frost-free season is about 90 to 120 days long.

Vegetation on soils of this series is mostly grand fir, western redcedar, Douglas-fir, willows, sedges, grasses, and plants that tolerate wetness.

In some areas Potlatch soils are associated with Greencreek soils. They are not so well drained as Greencreek soils, and their surface layer is darker. Potlatch soils are used for pasture, crops, and timber.

Potlatch silt loam, 0 to 7 percent slopes (PoA).--This soil is in broad swales and depressions. In most places slopes range from 0 to 5 percent. The surface layer is mottled gray and light brownish-gray silt loam about 12 inches thick. It is underlain by about 2 inches of mottled light-gray silt loam. The subsoil is mottled pale-brown clay to a depth between 14 and 27 inches, and then light brownish-gray, very dense clay to a depth of 35 inches. Below is light brownish-gray light clay and light-gray heavy sandy clay loam. The subsurface layer and the subsoil contain a few to common, fine, reddish or brownish iron concretions.

Typical profile of Potlatch silt loam under pasture, 400 feet west and 400 feet south of Glenwood School, in the NW 1/4 of SE 1/4 sec. 33, T. 34 N., R. 5 E.:

Apg--0 to 8 inches, gray (2.5Y 5/1) silt loam, very dark gray (2.5Y 3/1) moist; many, fine, prominent, reddish-brown (5YR 5/4) and brown (7.5YR 5/4) mottles and stains around root channels; weak, fine, granular structure; slightly hard; friable; slightly sticky; slightly plastic; many, fine and medium, fibrous roots; many micro interstitial pores; very strongly acid (pH 4.9); clear, wavy boundary.

A1g--8 to 12 inches, light brownish-gray (10YR 6/2) heavy silt loam, very dark gray (10YR 3/1) moist; common, fine, prominent and distinct, strong-brown (7.5YR 5/6) and brown (7.5YR 5/4) mottles; weak, medium, prismatic structure that breaks to weak, medium, subangular blocky; hard, friable, slightly sticky, slightly plastic; common, fine and medium, fibrous roots; many very fine and a few, fine, tubular pores; ped surfaces sprinkled with bleached silt grains; common, soft, yellowish-red concretions; very strongly acid (pH 4.8); wavy boundary.

A2g--12 to 14 inches, light gray (2.5Y 7/2) silt loam, dark gray (2.5Y 4/1) moist; fine, distinct, light yellowish-brown (10YR 6/4) and very pale brown (10YR 7/4) mottles; weak, medium and coarse, subangular blocky structure; slightly hard, friable; slightly sticky, slightly plastic; common, fine, fibrous roots; many, very fine, tubular pores; a few, soft, yellowish-red concretions; mostly bleached grains; slight to moderate amounts of very fine mica; strongly acid (pH 5.1); abrupt, wavy boundary.

B21t--14 to 27 inches, pale-brown (10YR 6/2) clay, dark grayish-brown (10YR 4/2) moist; common, coarse and medium, light-gray (2.5Y 7/1) and yellowish-brown (10YR 5/4) mottles; strong, coarse, prismatic structure that breaks to weak, fine and medium, subangular blocky; very hard, very firm, very sticky, very plastic; a few roots along ped faces; a few, very fine, tubular pores; thin nearly continuous clay films on peds and thick continuous clay films in pores; sprinkling of clean silt grains on peds; common, soft, yellowish-brown and a few, soft, black concretions; strongly acid (pH 5.2); clear, smooth boundary.

B22t--27 to 35 inches, light brownish-gray (10YR 6/2) very dense clay, dark grayish brown (10YR 5/2) moist; a few, medium, distinct yellowish-brown (10YR 5/4) mottles; weak, medium and coarse, angular blocky structure; extremely hard, very firm, very sticky, very plastic; a few, very fine, tubular pores; a few pressure faces; thin nearly continuous clay films on peds; bleached silt coating on peds; a few, soft, fine, black concretions; slightly acid (pH 6.5); clear, wavy boundary.

B23tg--35 to 55 inches, light brownish-gray (2.5Y 6/2) light clay, grayish brown (2.5Y 5/2) moist; many, coarse, prominent, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles that decrease in number with depth; weak, medium, angular blocky structure; extremely hard, very firm, very sticky, very plastic; a few, very fine, tubular pores; thin patchy clay films on peds and medium patchy clay films in pores; a few, fine, black concretions; a few black stains; slightly acid (pH 6.4); abrupt, irregular boundary.

IIB3tg--55 to 80 inches, light-gray (5Y 6/1) gravelly heavy sandy clay loam, gray (5Y 5/1) when moist; many, coarse, prominent, light yellowish-brown (10YR 6/4), yellowish-brown (10YR 5/4), and dark-brown (10YR 3/3) mottles; massive; very hard, firm, very sticky, very plastic; a few, very fine, tubular pores; medium continuous clay films in pores; many black stains; pH 6.8.

The slightly dark colored Apg horizon is 6 to 10 inches thick. Depth to the B2t horizon ranges from 10 to 18 inches. A few to common, fine, yellowish-red and yellowish-brown, iron concretions are in the A1g, A2g, and B21t horizons. Common or a few, fine, black concretions or stains are in the B22t and B23tg horizons.

The available water capacity is high in Potlatch silt loam, 0 to 7 percent slopes. Permeability of the subsoil is slow. Runoff is slow, and the erosion hazard is slight. The water table, which fluctuates considerably, is 24 to 60 inches below the surface most of the year.

About 20 percent of the acreage of this soil is cultivated. The rest is mainly pasture. This soil is better suited to hay and pasture than to cultivated crops. Small grains, clovers, and grasses are the principal crops, though wheat, oats, and barley are grown in some areas. Capability unit IIIw-1; not used as range or as woodland.

Potlatch-Greencreek loams, 7 to 25 percent slopes (PrC).--This complex is mostly near Meadow Creek in the southern part of the survey area. It is on old dissected alluvial fans, terraces, and on landslide deposits. Seepage areas are common around small springs.

About 45 to 65 percent of the acreage of this complex is Potlatch loam, and about 20 to 40 percent is Greencreek loam. The Potlatch soil is mostly in swales, drainageways, and areas affected by seepage. The Greencreek soil is less sloping than Greencreek loam, 5 to 30 percent slopes, but it otherwise is similar. It occupies the steeper slopes and spurs of ridges in the complex that are between the intermittent drainageways and swales.

Included with this complex in mapping, and making up about 15 to 20 percent of the acreage, are soils that are similar to the Potlatch soil but are darker colored in the upper 10 to 18 inches. Other small included areas consist of soils that are similar to the Greencreek soil but have a surface layer less than 6 inches thick, a less red subsoil, and are less mottled.

The Potlatch soil in this complex is somewhat poorly drained, and the Greencreek soil is moderately well drained. Runoff is medium on the Potlatch soil, and the erosion hazard is moderate.

This complex is used mainly for producing timber. Small areas have been partly cleared and are used for pasture. Under good management, cleared areas are suitable for hay and pasture. Both parts, capability unit IVe-1; Potlatch part, woodland group 7, not used as range; Greencreek part, woodland group 1, not used as range.

Riverwash

Riverwash (Re) is in or near streambeds and flood channels and on islands or bars. It consists of loose sand, pebbles, cobblestones and other stones and contains a small amount of silt and clay. Most areas are flooded periodically, and during the floods some of the soil material is shifted about.

Many areas of Riverwash lack vegetation. Willows, brush, and some deciduous trees, however, grow in the finer material on the bars and islands. In places this vegetation furnishes protective cover for big game. Capability unit VIIIw-1; not used as range or as woodland.

Rock Land

Rock land (Rk) is about 50 to 90 percent outcrops of bedrock, detached stones and boulders, and soil less than 5 inches deep. Slopes are more than 45 percent. On the slopes that face south, some of the soil between the bedrock outcrop is moderately deep and is similar to the Gwin soil in Gwin-Klicker stony loams, 40 to 65 percent slopes. In places on the slopes that face north, the soil between the rock outcrops is moderately deep and is similar to Klicker rocky silt loam, 40 to 65 percent slopes.

The available water capacity is very low in this land type. Runoff is very rapid.

The vegetation on the small areas of very shallow soils consists mainly of shrubs, forbs, moss, and grass. A small amount of timber is obtained from the Klicker soil. The Gwin soil has value for grazing in places. Capability unit VIIIs-1; woodland group 4; South Slope range site.

Rock Outcrop

Rock outcrop (Ro) has outcrops of basalt or granite on more than 90 percent of the surface. Between the outcroppings are loose stones, angular cobblestones, and soil that is less than 5 or 6 inches deep. Slopes generally are more than 65 percent, and some are precipitous. Runoff is very rapid. Steep deposits of talus are common below the precipitous areas.

Most areas of Rock outcrop lack vegetation or have a cover of moss and other low-growing plants. A few trees grow in the crevices between the rocks where there is enough soil for the roots to take hold. Areas of Rock outcrop are used mainly as watershed and for recreation. Capability unit VIIIs-1; not used as range or as woodland.

Sallyann Series

The Sallyann series consists of moderately deep, well-drained or somewhat excessively drained, steep and very steep soils on uplands and mountains. These soils formed mainly in material weathered from greenstone and from related metamorphosed volcanic andesitic material.

Elevation ranges from 1,300 to 3,400 feet. The annual precipitation ranges from 24 to 28 inches, and the average annual soil temperature is about 48° F. The frost-free season is about 120 to 150 days long.

The vegetation on soils of this series is mostly ponderosa pine and Douglas-fir. The understory consists mostly of rattlesnake chess, fescue, wheatgrass, pinegrass, bluegrass, cheatgrass, ocean-spray, ninebark, snowberry, Oregon grape, wild rose, snowbrush, and associated forbs and shrubs.

Sallyann soils are associated mainly with Gwin soils that have bedrock at a depth of 20 inches or less. They are used mostly for producing timber and as summer range for big game.

Sallyann stony loam, 30 to 65 percent slopes (SaE).--This soil is in the southwestern part of the survey area. Slopes face north in most places, but some face south, especially at higher elevations.

The surface layer of this soil is dark-brown stony loam about 9 inches thick. The subsoil is about 22 inches of dark-brown, brown, and reddish-brown clay loam that is cobbly and gravelly. Depth to greenstone or related andesitic bedrock is 20 to 40 inches.

Typical profile on a 61 percent slope under woodland of ponderosa pine and Douglas-fir that has an understory of grasses, forbs, and shrubs; in the SE 1/4 of SE 1/4 sec. 18, T. 30 N., R. 4 E. (profile 60-Ida-25-20 sampled for laboratory analysis):

O1--1 inch to 0, slightly decomposed needles, leaves, cones, and pieces of wood; pH 5.5; abrupt, wavy boundary.

A11--0 to 4 inches, dark-brown (10YR 3/3) stony loam, very dark brown (10YR 1/2) when moist; weak, thin, platy and strong, fine and very fine, granular structure; hard, friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial and very fine tubular pores; some worm channels and casts; a few uncoated silt grains in places; pH 6.2; abrupt, wavy boundary.

A12--4 to 9 inches, dark-brown (10YR 3/3) stony loam, very dark brown (10YR 2/2) when moist; 10 to 15 percent is angular pieces of greenstone, moderate, fine, subangular blocky and moderate, fine, granular structure; hard, friable, slightly sticky, slightly plastic; many fine roots and a few medium roots; common, very fine, tubular pores; some worm channels and casts; a few uncoated silt grains; pH 6.4; clear, wavy boundary.

B1--9 to 14 inches, dark-brown (10YR 3/3) heavy cobbly and gravelly loam, very dark brown (10YR 2/2) when moist; about 20 to 30 percent is angular pebbles and cobblestones; moderate, medium and fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine roots and a few medium roots; common very fine tubular pores and a few, fine, tubular pores; thin patchy clay films on peds and in channels; pH 6.6; clear, wavy boundary.

B21t--14 to 22 inches, brown (7.5YR 4/3) cobbly and gravelly clay loam, very dark brown (7.5YR 2/2) when moist; 30 to 40 percent is angular greenstone pebbles and cobblestones; greenstone fragments are greenish gray (7.5GY 5/1); moderate, fine and very fine, subangular blocky structure; very hard, friable, sticky, plastic; a few fine and medium roots; common, very fine, tubular pores; thin patchy clay films on peds and thin or medium patchy clay films in channels; pH 6.8; clear, wavy boundary.

B22t--22 to 31 inches, reddish-brown (5YR 4/4) cobbly and gravelly clay loam, dark reddish brown (5YR 3/4) when moist; contains 5 to 7 percent more clay than the B21t horizon and about 40 or 50 percent angular greenstone pebbles and cobblestones; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; a few fine roots; a few, very fine, tubular pores; thin nearly continuous clay films on peds and thin or medium continuous clay films in channels; pH 6.6; abrupt, irregular boundary.

R--31 inches, greenstone bedrock of the Seven Devils formation.

The A horizon is silt loam in places. It ranges from dark brown to dark grayish brown in color. The B1 horizon is slightly gritty. The Bt horizon is clay loam or silty clay loam. It is gravelly, cobbly, stony, or very stony. Depth to bedrock ranges from 20 to 40 inches.

The available water capacity is moderate in Sallyann stony loam, 30 to 65 percent slopes. Permeability of the subsoil is moderately slow. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe.

Nearly all of the acreage of this soil is used for producing timber and as summer range for big game. Capability unit VIIe-1; woodland group 4; not used as range.

Suttler Series

The Suttler series consists of deep, well-drained, rolling to very steep soils on uplands, chiefly in the eastern part of the Area. These soils formed mainly in material weathered from mica-schist, gneiss, granite, and similar acid rocks. In some places, however, the surface layer formed partly in windlaid silty material.

Elevation ranges from 2,500 to 5,000 feet. The annual precipitation is 30 to 40 inches, and the average annual temperature is about 40° F. The frost-free season is 70 to 100 days long.

Vegetation on these soils is mainly grand fir but includes some western redcedar, Douglas-fir, ponderosa pine, and western white pine. The understory consists mostly of snowberry, wild rose, thimbleberry, willow, twinflower, ferns, ocean-spray, ninebark, syringa, and associated forbs and shrubs.

Suttler soils are near the Jughandle, Molly, Lochsa, and Greencreek soils. They are used mostly

for producing timber and as summer range for big game.

Suttler loam, 7 to 12 percent slopes (SuB).--This soil is on ridgetops. In wooded areas about 3 inches of organic matter overlies a surface layer of grayish-brown loam that is about 4 inches thick. The subsoil is about 22 inches of brown loam over about 14 inches of brown and light yellowish-brown fine sandy loam or light loam. The subsoil is underlain by light brownish-gray and light-gray fine sandy loam at a depth of about 40 inches. At a depth of about 54 inches is weathered rock, mainly mica-schist.

Typical profile under Douglas-fir and grand fir, on an 8 percent slope that faces east, about 70 feet west of Green Creek Point Road, 1.8 miles north of the junction of Green Creek Point Road and Lightning Creek Road, and 28.36 chains west of the southeast corner of sec. 14, T. 30 N., R. 4 E. (profile 60-Ida-25-13 sampled for laboratory analysis):

O11--2 inches to 1 inch, undecomposed and slightly decomposed needles, leaves, cones, and twigs; pH 5.8.

O12--1 inch to 0, very dark brown (10YR 2/2), matted, moderately decomposed needles, leaves, cones, twigs, and wood, black (10YR 2/1) when moist; pH 5.8; abrupt, wavy boundary.

A1--0 to 4 inches, grayish-brown (10YR 5/2) loam that is about 2 percent very fine gravel, very dark brown (10YR 2/2) when moist; moderate, thin, platy and weak, very fine and fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots and common coarse roots; many micro interstitial pores and common very fine tubular pores; moderately to highly micaceous; lower part has pockets of light brownish-gray (10YR 6/2) A2 horizon material that contains partly uncoated grains; pH 5.2; clear, wavy boundary.

B1--4 to 9 inches, brown (10YR 5/3 to 7.5YR 5/3) loam that is 1 or 2 percent very fine gravel, dark brown (10YR 3/3 to 7.5YR 3/3) when moist; weak, coarse and medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine roots and a few medium and coarse roots; common very fine tubular pores; thin patchy clay films in some channels; a few partly uncoated grains; moderately micaceous; pH 5.8; gradual, wavy boundary.

B2--9 to 26 inches, brown (10YR 5/3 to 7.5YR 5/3) loam that is 1 to 2 percent very fine gravel, dark brown (10YR 3/3 to 7.5YR 3/3) when moist; weak, medium and coarse, subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many fine and medium roots; common very fine and a few fine tubular pores; thin patchy clay films in channels and a few thin clay films on peds; several continuous, wavy horizontal, very thin (about 0.1 inch), more clayey bands with continuous clay films; slight bleached silt coating on peds; moderately micaceous; pH 5.3; gradual, wavy boundary; possibly this horizon is a very weak fragipan.

B3--26 to 40 inches, brown (10YR 5/3) and light yellowish-brown (2.5Y 6/3) fine sandy loam or light loam that is about 10 percent rocky material, mostly pebbles or channery fragments; dark brown (10YR 3/3) and olive brown (2.5Y 4/3) when moist; weak or very weak, coarse and medium, subangular blocky structure; hard, firm, slightly sticky, slightly plastic; a few fine roots; common very fine and a few fine tubular pores; a few, very thin (about 0.1 inch), clayey bands; thin patchy clay films in channels; highly micaceous; pH 4.7; gradual, wavy boundary.

C1--40 to 54 inches, light brownish-gray (2.5Y 6/2) and light-gray (2.5Y 7/2) gravelly fine sandy loam that is about 15 percent channery fragments; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) when moist; common, medium, distinct, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) stains and mottles that are dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) when moist; weak, thin, platy structure; hard, firm, slightly sticky, nonplastic; a few fine roots; a few very fine tubular pores; highly micaceous; pH 4.6; gradual, irregular boundary.

C2--54 inches, weathered rock, mainly mica-schist; pH 4.9.

In areas that have been burned over or disturbed, the O1 horizon is missing in places. The A horizon ranges from 3 to 5 inches in thickness. The A1, B1, and B2 horizons are grayish brown to brown, and in places these horizons contain a few pebbles, cobblestones, or other stones. In places the B2 horizon is light sandy clay loam. Depth to weathered bedrock ranges from 40 to 60 inches.

Included with this soil in mapping were small areas where depth to bedrock is less than 40 inches. Also included were small areas of very deep soils.

Permeability is moderate in Suttler loam, 7 to 12 percent slopes. The available water capacity and natural fertility are moderate. Runoff is medium, and the erosion hazard is moderate.

This soil is used mostly for producing timber or as summer range for big game. Capability unit IIIe-1; woodland group 8; not used as range.

Suttler loam, 12 to 30 percent slopes (SuC).--This soil has longer, steeper slopes and contains more gravel, cobblestones, and other stones than Suttler loam, 7 to 12 percent slopes, but otherwise the two soils are similar. Depth to consolidated bedrock is about 40 to 50 inches. Runoff is medium, and the erosion hazard is moderate.

This soil is used mainly for producing timber and as summer range for big game, to which it is best

suited. Capability unit VIe-1; woodland group 8; not used as range.

Suttler loam, 30 to 65 percent slopes (SuE).--This soil is in the higher part of the uplands in the eastern part of the Area. Its subsoil ranges from loam to fine sandy loam, and depth to somewhat weathered bedrock ranges from 40 to 50 inches. Rock fragments are more common than in Suttler loam, 7 to 12 percent slopes. Included in mapping were some areas as shallow as 30 inches. Rock crops out in places.

Runoff is rapid to very rapid on this soil. The erosion hazard is severe to very severe.

Nearly all of this soil is used for producing timber or as summer range for big game. Capability unit VIIe-1; woodland group 8; not used as range.

Weedmark Series

The Weedmark series consists of deep, well-drained, moderately sloping to steep soils on uplands. These soils are mostly in the northern part of the survey area. They formed in material weathered mainly from granite, quartz monzonite, quartz diorite, gneiss, mica-schist, or similar kinds of bedrock. In places, however, the upper layers formed partly in wind-laid silty material.

Elevation ranges from 2,800 to 3,500 feet. The average annual precipitation is 25 to 30 inches, and the average annual soil temperature is about 48° F. The frost-free season is 120 to 150 days long.

The vegetation on soils of this series is mostly ponderosa pine. Douglas-fir, grasses, shrubs, and forbs grow in places.

They are next to Lochsa soils in places on steeper slopes and are next to Kooskia silt loam on ridgetops. Weedmark soils are used for cutlivated crops, pasture, and woodland.

Weedmark loam, 12 to 25 percent slopes (WmC).--This soil is on ridgetops or plateaus, mostly in the northern part of the survey area. The surface layer is dark grayish-brown to brown loam or silt loam about 17 inches thick. The subsoil is brown and yellowish-brown to reddish-brown clay loam and is about 26 inches thick. Depth to consolidated bedrock is 40 to 55 inches.

Typical profile on a 25 percent slope that faces south under ponderosa pine and grass; 400 feet northeast of the corner of the road; in the NE 1/4 of SE 1/4 sec. 18, T. 34 N., R. 4 E.:

A11--0 to 3 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak or moderate, thin, platy and weak, fine and medium, granular structure; hard, friable, slightly sticky, slightly plastic; many, fibrous, fine and medium roots and common coarse roots; many micro interstitial pores and common, very fine, tubular pores; a few uncoated silt grains and slight to moderate quantity of sand grains, including quartz; small quantity of very fine mica; pH 5.3; clear, smooth boundary.

A12--3 to 9 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, fine, subangular blocky and weak, fine, granular structure; hard, friable, slightly sticky, slightly plastic; many fibrous, fine and medium roots and common coarse roots; many micro interstitial pores and common, very fine, tubular pores; a few worm channels and casts; a few uncoated silt grains; pH 5.3; clear, wavy boundary.

A3--9 to 17 inches, brown (10YR 4/3) (10YR 5/3, rubbed) heavy loam, very dark brown (10YR 2/3) (10YR 2/2, rubbed) when moist; weak or moderate, fine and medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine and medium roots and a few coarse roots; common, very fine, tubular pores; moderate quantity of coarse and very coarse quartz sand; small quantity of very fine mica; pH 5.3; clear, wavy boundary.

B1t--17 to 25 inches, yellowish-brown (10YR 5/4) clay loam, dark brown (7.5YR 3/3) when moist; moderate, fine and medium, subangular blocky structure; hard, friable, sticky, plastic; a few fine and medium roots; common, very fine, tubular pores; a few thin clay films on peds and thin patchy clay films in pores; a few black manganese concretions; small quantity of very fine mica; moderate quantity of coarse and very coarse sand, mostly quartz; pH 5.5; clear, wavy boundary.

B21t--25 to 33 inches, brown (7.5YR 5/4) clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium and fine, subangular blocky structure; very hard, firm, sticky, plastic; a few fine and medium roots; common, very fine, tubular pores; thin or medium patchy clay films on peds and in pores; moderate quantity of fine mica; pH 5.4; clear, wavy boundary.

B22t--33 to 43 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; weak or moderate, medium, prismatic and moderate, medium and fine, subangular blocky structure; very hard, firm, sticky, plastic; a few fine and medium roots; common very fine tubular pores and a few fine tubular pores; thin or medium, patchy, reddish-brown (5YR 4/4) clay films on peds and medium or thick continuous clay films in pores, dark reddish brown (5YR 3/4) when moist; some angular gravel; moderate quantity of fine mica; pH 5.5; clear, wavy boundary.

R--43 inches, moderately weathered quartz monzonite bedrock; many, yellowish-red (5YR 5/6), iron stains on mineral grains; thick or medium, continuous, reddish-brown (2.5YR 4/4) and dark reddish-brown (2.5YR 3/3) clay films in some cracks of the bedrock; pH 5.6.

The A horizon ranges from 10 to 18 inches in thickness, and from loam to silt loam in texture. Depth to somewhat consolidated bedrock ranges from 40 to 55 inches.

Included with this soil in mapping are small areas of soil as shallow as 20 inches.

The available water capacity is moderate in Weedmark loam, 12 to 25 percent slopes. Permeability is moderately slow in the subsoil. Fertility is moderate. Runoff is medium, and the erosion hazard is moderate.

About 50 percent of the acreage of this soil is used for cultivated crops. The other 50 percent is used for pasture or woodland. Alfalfa, clovers, grasses, and small grains are the principal cultivated crops. Capability unit IVe-1; woodland group 6; not used as range.

Weedmark loam, 12 to 25 percent slopes, eroded (WmC2).--The surface layer of this soil is about 8 to 13 inches thick. Runoff is medium to rapid, and the erosion hazard is moderate to severe. Small shallow gullies have formed where runoff water collects.

About half the acreage of this soil is cultivated, and the other half is used for pasture. Alfalfa, clovers, grasses, and small grains are the prinipal crops. Capability unit IVe-1; woodland group 6; not used as range.

Weedmark loam, 25 to 45 percent slopes (WmD).--This soil contains small angular quartz fragments and larger rock fragments in many places. These fragments range from a few to as much as 30 percent of the soil material.

Included with this soil in mapping are some areas of moderately eroded soil. These areas are indicated on the detailed soil map by an erosion symbol. In places the dark-colored surface layer, 6 to 12 inches thick, still remains. Also included are small shallow gullies that have formed where water collects.

Runoff is rapid on this Weedmark soil, and the erosion hazard is severe.

Most of the acreage is used for producing timber. A small acreage has been cleared for crops and pasture, but this soil is not suited to crops. Capability unit VIe-1; woodland group 6; not used as range.

Weedmark silt loam, 7 to 12 percent slopes (WeB).--This soil is on ridgetops. More wind-laid silty material was deposited on areas of this soil than in areas of Weedmark loams.

Runoff is slow to medium on this soil. The erosion hazard is slight to moderate.

About 65 percent of the acreage of this soil is used for cultivated crops. The rest is used for woodland and pasture. Small grains, alfalfa, clovers, and grasses are the main cultivated crops (pl. IV). Capability unit IIIe-1; woodland group 6; not used as range.

Yakus Series

The Yakus series consists of shallow, well-drained, moderately steep to very steep soils on mountainous uplands and on slopes of deep canyons. Slopes face south in most places. These soils formed mainly in material weathered from quartz monzonite, quartz diorite, granite, gneiss, and other similar coarse- or medium-grained acidic rock.

Elevation ranges from 1,100 to 3,700 feet, and the average annual precipitation is 21 to 27 inches. The average annual soil temperature is about 48° F. The frost-free season is 120 to 150 days long.

The vegetation on the soils of this series is mostly bunchgrasses and associated forbs. Ponderosa pines grow in a few areas, however.

Yakus soils are medium acid to slightly acid. They are associated with Lochsa soils in places. Yakus soils are used mostly for pasture.

Yakus coarse sandy loam, 40 to 65 percent slopes (YaE).--This soil is mainly in the western part of the survey area on long canyon slopes that face south and southwest. The surface layer is dark grayish-brown loam or coarse sandy loam about 4 inches thick. The subsoil is of fine gravelly loam or light sandy clay loam about 7 inches thick.

Typical profile under range of grasses and forbs; 2 1/2 miles down from the top of Greer Grade Road, 1,080 feet south on logging road, and 100 feet up a 59 percent south-facing slope, near the center of the SW 1/4 sec. 30, T. 35 N., R. 3 E.:

A1--0 to 4 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, medium, platy structure that breaks to strong, very fine, granular in the upper part and weak, fine, subangular blocky in the lower part; slightly hard, very friable, slightly sticky, slightly plastic; many fibrous and fine roots; many micro interstitial pores; about 15 to 20 percent is gravel and very coarse sand; small quantity of mica; pH 6.0; clear, wavy boundary.

B2--4 to 11 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, medium, fine and very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; a few, fibrous, fine and medium roots; many, very fine, tubular pores; a few thin clay films; about 15 to 20 percent is gravel and very coarse sand; small amount of mica; pH 6.0; clear, wavy boundary.

C--11 to 16 inches, white (10YR 8/2), moderately disintegrated, hard to very hard, semiconsolidated quartz monzonite or quartz diorite; stained brown to strong brown (7.5YR 5/5 in matrix; medium or thick, nearly continuous, dark reddish-gray (5YR 4/2) and reddish-brown (5YR 4/3) clay films and stains

in main cracks; one or more thin reddish-brown layers that are mostly horizontal and have clay films and stains; a few roots; pH 6.4.

R--16 inches, bedrock.

The A horizon is mostly coarse sandy loam and 4 to 10 inches thick. It is gritty or contains gravelly loam in places. The subsoil ranges from gritty loam to fine gravelly loam or light sandy clay loam. Depth to somewhat consolidated bedrock is 9 to 20 inches.

The available water capacity is low in Yakus coarse sandy loam, 40 to 65 percent slopes. Permeability is moderate in the subsoil. Runoff is very rapid, and the erosion hazard is very severe.

Nearly all of this soil is used for grazing by livestock and big game. Capability unit VIIe-1; Granitic South Slope range site; not used as woodland.

Yakus coarse sandy loam, 12 to 40 percent slopes (YaD).--This soil is mainly on ridgetops and the upper parts of the sides of deep canyons. Runoff is medium to rapid, and the erosion hazard is moderate to severe.

Nearly all the acreage of this soil is used for grazing by livestock and big game. Capability unit VIe-2; Granitic range site; not used as woodland.

Yakus-Lochsa sandy loams, 40 to 65 percent slopes (YlE).--This complex is about 40 to 60 percent shallow Yakus sandy loam, and about 20 to 40 percent Lochsa sandy loam. The Yakus soil is on south-facing slopes. The Lochsa soil, on north-facing slopes, is steeper than the typical soil described for the Lochsa series, but otherwise it is similar.

Included with this soil in mapping are small areas occupied by rock outcrops and extremely shallow soils.

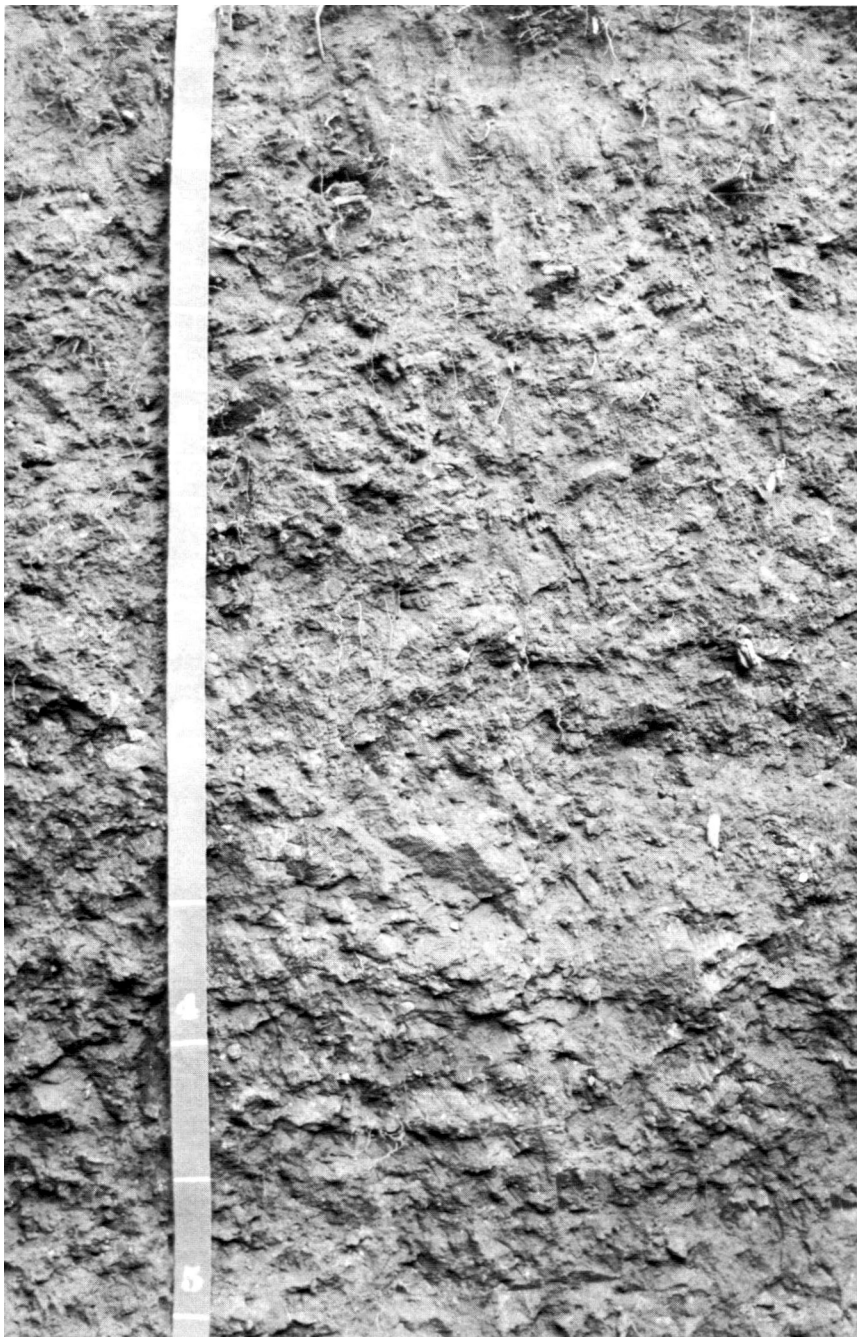
The Yakus soil in this complex is well drained, and the Lochsa soil is somewhat excessively drained. Runoff is very rapid on both these soils, and the erosion hazard is very severe.

On the Yakus soil the vegetation is mainly bunchgrasses and forbs but includes some shrubs. On the Lochsa soil the vegetation is mainly ponderosa pine, but Douglas-fir grows in places.

Most of the acreage of this complex is used for grazing by livestock and big game, though timber is harvested in places on the Lochsa soil. Both parts, capability unit VIIe-1; Yakus part, Granitic South Slope range site, not used as woodland; Lochsa part, woodland group 5, not used as range.

Crops and seeded pasture on rolling and hilly ridgetops in soil association 1. Wheat stubble near farm buildings is on Kooskia silt loam, 12 to 25 percent slopes.

Typical landscape of soils in association 3, in the right background, and of soils in association 5, in the center. Crane Hill is in the left background.



Profile of Caribel silt loam, 0 to 7 percent slopes. (Depth shown in feet.)

Profile of Kooskia silt loam, 0 to 7 percent sl

Wheat stubble on Kooskia silt loam, 7 to 12 percent slopes, helps to reduce runoff and erosion. In the background are Douglas-fir and ponderosa pine on Weedmark loam, 25 to 45 percent slopes.

Wheat and hay grown in strips for control of runoff and erosion on Kooskia silt loam, 12 to 25 percent slopes.

PLATE IV

Harvested field of alfalfa on Weedmark silt loam, 7 to 12 percent slopes, in foreground. Douglas-fir and ponderosa pine on Weedmark loam, 25 to 45 percent slopes, in background.

Ponderosa pine and Douglas-fir on Kooskia silt loam, 0 to 7 percent slopes.

This section briefly describes the system of capability classification used by the Soil Conservation Service, and then discusses the management of the soils by capability groups. Next estimated yields are given for soils that are used for crops and pasture. Then suitability of the soils for use as range and as woodland and use of the soils for wildlife are discussed. Following this use of the soils for recreation and for engineering are described.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use. (None in the Kooskia Area.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in the Kooskia Area.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by w, s, and c, because the soils in Class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or VIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by Capability Units

In the pages that follow, the capability units in the Kooskia Area are described and suggestions for the use and management for all the soils of each unit are given. The names of all soils in any given capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Crops on most soils in the Area respond if fertilizer is applied. The need for fertilizer depends on the kind of soil, the crop that is grown, and the past and present management. Also, most of the soils are acid and require some lime. The kinds and amounts of fertilizer and lime to use can be determined by soil tests.

Capability Unit IIe-1

This unit consists of nearly level to gently sloping, well-drained soils. These soils have a surface layer of loam or silt loam. The subsoil is moderately coarse textured to medium textured.

These soils have moderately high fertility. Permeability of the subsoil is moderate to moderately rapid. Available water capacity is moderate to high. Runoff is slow, and the erosion hazard is slight. The frost-free season ranges from about 130 to 170 days.

Dryness in summer limits the choice of crops that can be grown on these soils. Small grains, peas, alfalfa, clover, and grasses are well suited. The soils are well suited to sprinkler irrigation, and soft fruits, truck crops, and berries do well under irrigation.

A suitable cropping system is 1 or 2 years of alfalfa and grass followed by 1 or 2 years of small grains. Returning crop residues to the soil helps to maintain fertility and the content of organic matter. Grassed waterways can be used for removing excess water from slopes above, and use of rough tillage in fall helps to reduce erosion on fields left bare in winter. Pastures can be kept productive and desirable kinds of grasses can be maintained in the pastures by rotating grazing. Crops on these soils respond if fertilizer that contains nitrogen and phosphorus is applied.

Capability Unit IIIe-1

This unit consists of nearly level to moderately steep, well drained and moderately well drained soils. These soils have a surface layer of loam or silt loam. The subsoil is moderately coarse textured to moderately fine textured. Some areas are eroded.

These soils have moderate to high fertility. Permeability of the subsoil is slow to moderately rapid. Roots can penetrate the subsoil to a depth of 3 feet or more. Runoff is slow to medium, and the erosion hazard is slight to moderate. The frost-free season ranges from 70 to 170 days.

These soils are suited to small grains, alfalfa, clover, peas, and grasses. A suitable cropping system is 4 or 5 years of alfalfa and grass followed by 2 or 3 years of small grains or peas.

Returning crop residues to the soils helps to maintain fertility and the content of organic matter. Tillage across the slope and use of grassed waterways that divert water from higher areas are needed in many places. Use of rough tillage in fall helps to reduce erosion on fields left bare in winter. Small grains and grasses on these soils respond to nitrogen and phosphorus, and legumes respond to phosphorus and sulfur. Pastures can be kept productive by rotating grazing and controlling weeds.

Capability Unit IIIw-1

This unit consists of nearly level and gently sloping, somewhat poorly drained, very deep soils. The surface layer is loam or silt loam, and the subsoil ranges from sandy clay loam to clay.

Fertility is moderate to high in these soils. Permeability of the subsoil is moderately slow or slow. Depth to the water table is 2 feet or less for variable periods in spring, and in places a perched water table occurs. Runoff is slow, and the erosion hazard is slight. Flooding is a hazard in some areas. The frost-free season ranges from 90 to 140 days.

These soils are fairly well suited to small grains, clover, trefoil, and grasses. A suitable cropping system is about 3 or 4 years of clover and grass followed by 2 or 3 years of small grains.

Returning all crop residues to these soils helps to maintain fertility and the content of organic matter. In places open drains are needed for removing excess water. Pastures can be kept productive by rotating grazing and controlling weeds. Crops on these soils respond to nitrogen, phosphorus, and sulfur.

Capability Unit IVe-1

This unit consists of deep to very deep, nearly level to moderately steep or hilly, well drained, moderately well drained, and somewhat poorly drained soils. The surface layer is loam or silt loam. The subsoil is medium textured to fine textured. Some areas are eroded.

These soils have moderately high to moderately low fertility. Permeability of the subsoil is moderate to slow. Runoff is slow to rapid, and the hazard of water erosion is slight to severe. Roots penetrate to a depth of more than 3 feet in these soils. The average frost-free season ranges from about 50 to 170 days.

These soils are fairly well suited to alfalfa, clover, grasses, and small grains. A suitable cropping system is about 6 to 8 years of alfalfa followed by 2 years of small grains.

Returning crop residues to the soil helps to maintain fertility and the content of organic matter and helps to control erosion. Tillage across the slope and use of grassed waterways for removing excess water are needed in places. Pastures can be kept productive by rotating grazing and controlling weeds and brush. The use of rough tillage in fall helps to reduce erosion on fields left bare in

winter. Small grains on these soils respond if fertilizer that contains nitrogen and phosphorus is applied, but legumes and grass require sulfur in addition to nitrogen and phosphorus.

Capability Unit VIe-1

This unit consists of moderately steep or hilly and steep, well-drained or somewhat excessively drained soils. The surface layer is loam, silt loam, or sandy loam.

These soils have moderate to moderately low fertility. Permeability of the subsoil is moderately rapid to slow. Runoff is medium to rapid, and the erosion hazard is moderate to severe. Roots penetrate these soils to a depth of 3 or more feet. The frost-free season ranges from about 10 to 170 days.

The soils in this unit are not suited to cultivated crops, but they can be used for perennial legumes and for grasses grown for pasture and hay. They also are suited to trees and to use as wildlife habitat. Management of these soils for timber is discussed in the section "Use of the Soils as Woodland."

Capability Unit VIe-2

This unit consists of hilly to steep, well-drained or somewhat excessively drained soils. These soils have a surface layer of loam, silt loam, or sandy loam. Some areas are stony, and others are eroded.

Runoff is medium to rapid on these soils. The hazard of water erosion is moderate to severe. Permeability of the subsoil is slow to moderate. The frost-free season ranges from about 100 to 160 days.

These soils are used for cultivated crops in places, though crops on them are difficult to cultivate and harvest. The erosion hazard makes these soils better suited to grazing than to other uses. Management of these soils for range is discussed in the section "Use of the Soils for Range."

Capability Unit VIs-1

Only Klicker rocky silt loam, 12 to 40 percent slopes, is in this unit. It is well drained and is moderately deep. Many angular stones and rocks are in the surface layer.

Runoff is medium to rapid on these soils. The hazard of water erosion is moderate to severe. The frost-free season is about 70 to 120 days long.

These soils are better suited to trees than to other uses. Management of the soils for trees is discussed in the section "Use of the Soils as Woodland."

Capability Unit VIIe-1

This unit consists of steep or very steep, well-drained or somewhat excessively drained soils that are shallow to very deep. These soils have a surface layer of loam, silt loam, or sandy loam. Many areas are stony, cobbly, or rocky.

Runoff is medium to very rapid on these soils. The hazard of water erosion is severe to very severe. Permeability of the subsoil is moderately slow to moderately rapid.

These soils are suited to grazing and to timber production. Rock outcrops, however, interfere with tree harvest and with other management. Management of these soils for woodland and range is discussed in the sections "Use of the Soils for Range" and "Use of the Soils as Woodland."

Capability Unit VIIs-1

This unit consists of steep to very steep, well-drained or somewhat excessively drained soils that are very shallow to very deep. These areas are rocky or extremely rocky. Permeability of the subsoil is moderately slow to moderately rapid. Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe.

The soils in this unit are suitable for grazing and timber production. Management for these purposes is discussed under "Use of the Soils for Range" and "Use of the Soils as Woodland."

Capability Unit VIIIw-1

This unit consists of sandy, very gravelly or very cobbly deposits that are in or adjacent to streams. Most areas are flooded periodically.

Areas of this unit are mostly barren of vegetation and have little value as woodland or for grazing. They are a source of sand and gravel, and they provide some habitat for wildlife.

Capability Unit VIIIs-1

The land types in this unit are Rock land and Rock outcrop. They are steep and very steep. Much of the acreage consists of outcrops of rock, but minor areas of very shallow soils are included. Runoff is rapid or very rapid, and the hazard of water erosion is very severe.

Areas of this unit are suitable only for watershed, wildlife habitat, and scenic appreciation.

Estimated Yields

Table 2 gives estimates of long-term average yields of the principal nonirrigated crops and of

TABLE 2.--ESTIMATED AVERAGE YIELDS PER ACRE OF

[Yields in columns A can be expected under prevailing management; those in columns B can be expected under the level specified. Soils used mainly for range, woodland,

Soil	Wheat				Barley		Oats		Peas (dry)	
	Spring		Winter							
	A	B	A	B	A	B	A	B	A	B
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Caribel silt loam, 0 to 7 percent slopes	20	46	25	46	28	55	40	75	21	45
Caribel silt loam, 7 to 12 percent slopes	20	44	22	43	27	53	40	75	20	42
Caribel silt loam, 12 to 25 percent slopes	18	43	21	42	27	53	39	70	17	35
Helmer silt loam, 0 to 7 percent slopes	21	44	25	46	28	55	40	75	21	42
Helmer silt loam, 7 to 12 percent slopes	20	43	22	44	27	53	40	75	21	41
Helmer silt loam, 12 to 25 percent slopes	19	40	21	43	26	53	39	73	20	37
Jacknife silt loam, 7 to 12 percent slopes	22	43	25	48	30	56	40	76	20	41
Jacknife silt loam, 12 to 25 percent slopes	16	35	18	38	28	53	38	73	18	38
Jacknife silt loam, loamy variant, 0 to 7 percent slopes	23	47	25	49	30	58	45	84	21	42
Jacknife silt loam, loamy variant, 7 to 12 percent slopes	22	45	23	48	29	58	44	83	20	41
Jacknife silt loam, loamy variant, 12 to 25 percent slopes	20	42	22	46	28	56	43	81	19	40
Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded	18	37	20	41	27	54	37	76	17	39
Kooskia silt loam, 0 to 7 percent slopes	23	49	26	48	34	59	41	77	21	44
Kooskia silt loam, 7 to 12 percent slopes	20	46	24	47	32	56	39	74	19	43
Kooskia silt loam, 7 to 12 percent slopes, eroded	20	43	21	44	29	53	37	71	18	42
Kooskia silt loam, 12 to 25 percent slopes	18	40	20	41	28	52	36	71	18	42
Kooskia silt loam, 12 to 25 percent slopes, eroded	17	35	18	35	26	45	35	63	16	35
Nicodemus loam, 0 to 7 percent slopes	23	48	25	51	32	58	43	84	18	40
Nicodemus loam, 7 to 12 percent slopes	21	45	22	45	30	55	41	79	17	36
Potlatch silt loam, 0 to 7 percent slopes	15	33	17	35	20	40	35	65	---	---
Weedmark silt loam, 7 to 12 percent slopes	20	41	25	47	28	50	40	78	20	40
Weedmark loam, 12 to 25 percent slopes	18	37	22	44	26	46	38	76	18	36
Weedmark loam, 12 to 25 percent slopes, eroded	17	35	21	40	25	43	37	72	16	34

1/ Animal-unit month. A term used to express the carrying capacity of pasture. It is the number of animal units, or 1,000 pounds of live weight, that can be grazed on an acre of pasture for a period of 30 days.

improved management. Absence of yield indicates soil is not suited to the crop or the crop is seldom grown at wildlife, or recreation are not included in this table]

Hay						Pasture						Alsike seed	
Alfalfa and grass		Grass		Red clover and grass		Alfalfa and grass		Grass		Clover and grass			
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Tons	Tons	Tons	Tons	Tons	Tons	A.U.M. [1/]	A.U.M. [1/]	A.U.M. [1/]	A.U.M. [1/]	A.U.M. [1/]	A.U.M. [1/]	Lb.	Lb.
1.7	2.7	1.7	2.5	1.7	2.8	4.2	6.8	4.2	6.3	4.2	7.0	215	375
1.7	2.7	1.7	2.5	1.7	2.8	4.2	6.8	4.2	6.3	4.2	7.0	200	350
1.7	2.7	1.6	2.5	1.8	2.8	4.2	6.8	4.0	6.3	4.1	6.8	190	340
---	---	1.7	2.5	1.7	3.1	---	---	4.2	6.3	4.5	7.8	215	350
---	---	1.5	2.5	1.7	3.1	---	---	4.2	6.3	4.5	7.8	200	400
---	---	1.5	2.5	1.7	3.0	---	---	4.0	6.3	4.4	7.5	200	400
1.5	3.0	1.2	2.2	1.7	2.5	3.8	7.5	3.0	5.5	4.2	6.3	200	450
1.5	3.0	1.2	2.2	1.5	2.5	3.8	7.5	3.0	5.5	3.8	6.3	175	400
1.5	3.0	1.2	2.2	1.2	2.5	3.8	7.5	3.0	5.5	3.0	6.3	160	300
1.5	3.0	1.2	2.2	1.2	2.5	3.8	7.5	3.0	5.5	3.0	6.3	200	410
1.4	2.9	1.2	2.2	1.2	2.5	3.5	7.2	3.0	5.5	3.0	6.3	175	400
1.3	2.6	1.1	2.1	1.2	2.5	3.2	6.5	2.8	5.2	3.0	6.3	145	300
1.3	2.7	1.0	2.0	1.5	3.0	3.2	6.8	2.5	5.0	3.8	7.5	175	450
1.3	2.7	1.0	2.0	1.5	3.0	3.2	6.8	2.5	5.0	3.8	7.5	200	470
1.3	2.7	1.0	2.0	1.5	3.0	3.2	6.8	2.5	5.0	3.8	7.5	180	440
1.3	2.7	1.0	2.0	1.5	3.0	3.2	6.8	2.5	5.0	3.8	7.5	175	420
1.1	2.5	1.0	2.0	1.3	2.7	2.8	6.2	2.5	5.0	3.0	7.0	150	300
1.0	2.0	2.0	3.0	1.5	2.8	3.0	6.0	6.0	9.0	4.5	8.4	175	400
1.6	2.0	1.8	3.2	1.8	3.1	4.8	8.7	5.4	9.6	5.4	9.3	175	400
---	---	1.6	2.5	2.0	3.2	---	---	4.8	7.5	6.0	9.6	210	400
1.5	2.2	1.3	2.0	2.0	2.9	3.8	5.5	3.2	5.0	5.0	7.2	200	370
1.5	2.2	1.3	2.0	2.0	2.9	3.8	5.5	3.2	5.0	5.0	7.2	175	360
1.4	2.0	1.0	1.8	1.6	2.6	3.5	5.0	2.5	4.5	4.0	6.5	160	325

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pasture that can be obtained under two levels of management. The yields in columns A are expected under the management now prevailing in the Area. The yields in columns B are expected under improved management.

The yields of nonirrigated crops in columns A are based largely on observations of soil scientists who surveyed the Area, on information from farmers and other agricultural workers who have had experience with the soils and crops of the Area, and on data from yield tables of areas that have soils similar to those in the survey area. Records of specific yields were not available for most of the soils.

The yields of nonirrigated crops in columns B are based largely on estimates made by those who have had experience with the soils and crops of the Area. The known deficiencies of the soil and their corrections within practical limits were considered in judging the potential increase in yields. The practical limits cannot be defined precisely, however, and the response to improved management cannot be predicted precisely. Yields in columns B can be compared with those in columns A, however, and knowledge of how the soil will respond to improved management can thus be obtained. Improved management will bring increased yields on most soils of the Area.

The following practices are required for the yields given under improved management in column B: (1) proper choice and rotation of crops, (2) correct use of commercial fertilizers and manure, (3) proper methods of tillage, (4) returning organic matter to the soil, (5) maintaining or improving the productivity and workability of the soil, (6) the conserving of soil material, plant nutrients, and soil moisture. Other specific requirements of good management vary according to the individual soils.

Use of the Soils for Range[3]

About 69,000 acres, or nearly 22 percent of the Kooskia Area, is native grassland. Most of the acreage is made up of soils that are too steep or too rocky for cultivated crops.

Beef cattle provide a major source of income for the ranchers and farmers in the survey area. The size of the brood herds varies greatly. Only 10 to 15 cows are in some of the herds; others have as many as 200. The dairy cattle provide dairy products for home use only. No commercial dairies are in the survey area. Sheep are raised on only a few ranches and farms.

In spring beef cattle are grazed mainly on native grassland. In summer they are grazed on public land under permit from the Forest Service, on land leased from timber companies, and on cropland that has been seeded for pasture. After returning from the summer ranges, the livestock generally are pastured on crop residue and volunteer grain. Then, late in fall and early in winter, they return to the native grassland. Winter feeding generally begins in December and ends about April. The cattle in the feedlots are fed alfalfa or clover and grass hay.

The Nez Perce Indians grazed animals in the survey area before the settlers arrived. These Indians, who were great horsemen, traveled on horseback in large bands. The valley around Kamiah and Kooskia was the headquarters for many members of this tribe.

Principles of Range Management

The conservation of soil and water and the production of large amounts of forage on rangeland depend mainly on the vigor and composition of the vegetation. Growth of roots and foliage, production of seed, and storage of food in the lower roots and stems are essential stages in the development of plants. Maximum forage is obtained by grazing management that allows these natural processes of growth to take place.

Livestock graze selectively and constantly seek out the palatable and nutritious plants. If grazing use is not carefully regulated, the better plants are weakened or eliminated. Less desirable plants then increase. If grazing is limited to less than half of the foliage produced by the key grasses, which are bunchgrasses in the Kooskia Area, deterioration of the better plants is minimized. Where the soil is unstable or slopes are steep, leaving a large percentage of the foliage helps to protect the soil.

Forage left on the ground provides the following benefits:

1. Serves as a mulch and increases the intake of water.
2. Supplies nutrients for good growth of roots and allows the roots to reach moisture that is deep in the soil.
3. Protects the surface layer from erosion by wind and water.
4. Allows the desirable grasses to increase and crowd out undesirable plants.
5. Enables plants to store in their roots the food they need for vigorous growth in spring.
6. Catches and holds snow where it falls so that the water from melting snow soaks into the soil.

Range Sites and Condition Classes

Range sites are kinds of rangeland that differ from each other in their ability to produce a significantly different kind or amount of original, or climax, vegetation.

Grasses are the principal forage plants in the survey area. The climax vegetation consisted of one or more perennial grasses and associated

[3] By Russell E. Smith, range conservationist, Soil Conservation Service.

perennial forbs. Few shrubby plants grew in the drier grassland areas. Some rose and snowberry plants, however, grew where effective moisture was highest and the environment was most favorable.

The present plants on a given range site indicate the intensity of grazing and the management to which the site has been subjected over the years. They also indicate the condition of the range. Range plants can be grouped into three classes according to their response to grazing use--decreasers, increasers, and invaders.

Decreasers are climax plants that decrease in relative abundance when the plant community is subjected to continuous moderately heavy to heavy grazing.

Increasers are climax plants that normally increase in relative abundance when the plant community is subjected to continuous moderately heavy to heavy grazing. Increasers are less palatable than decreasers. They increase in number as the density of the decreaser plants is reduced in the early stages of depletion. In the late stages of depletion, increasers act as decreasers because of the grazing use imposed upon them. They are then replaced by invaders.

Invaders are plants that are not native to the range site, and many of them are not native to the United States. Livestock generally do little grazing, if any, on these plants. Many invaders have awns or spines that injure the animals; others are toxic. Invaders generally produce little forage.

Range condition is the present state of the vegetation in relation to the climax conditions for the site. Four range condition classes are defined. A range in excellent condition has present from 76 to 100 percent of the vegetation that is characteristic of the climax vegetation on the same site; one in good condition, 51 to 75 percent; one in fair condition, 26 to 50 percent; and one in poor condition, less than 25 percent.

Ranchers want a range to be in excellent or good condition because such a range produces the most and has the most cover for soil and water conservation. Knowledge of the range site and range condition class helps a ranger tell how good his range is and how much better it can become under correct use.

The soils of the survey area have been grouped into four range sites. Each one has been given a descriptive name, such as "Loamy range site." Important information is given in the description of each site about soil characteristics, topographic features, principal grasses, and about how to use and manage the vegetation to keep the range in good or excellent condition. Total annual production, based on a limited number of plot clippings, also is given. A description of each range site follows. The soils in each site can be determined by referring to the "Guide to Mapping Units" at the back of this survey.

Loamy Range Site

In this range site are shallow to very deep loams and silt loams. These soils formed in material weathered from basalt and in wind-laid silt. Elevation ranges from 1,100 to 3,300 feet. Some of these soils are stony, and others are eroded.

The water-holding capacity of these soils is low to high. The average annual precipitation ranges from 21 to 28 inches.

This range site consists of areas where the crown density of the trees is less than 50 percent. As the crown density of trees in an area increases, the understory changes from grass and forbs to grass and short shrubs, and then to tall shrubs. At this point the area is no longer considered rangeland, and it is treated as woodland.

The soils in this range site are in an area of transition between prairie and woodland. The climax vegetation ranges from open bunchgrasses to mixed Douglas-fir and ponderosa pine that have an understory of grasses and shrubs. When the site is in excellent condition, the climax vegetation is made up mainly of Idaho fescue, bluebunch wheatgrass, prairie junegrass, California oatgrass, tapertip hawksbeard, arrowleaf balsamroot, yarrow, lupine, old-man's whiskers, cinquefoil, and salsify. Scattered snowberry and rose plants grow in places.

Grazing abuse of the native vegetation on this site is likely to change the cover to one of forbs and grasses that have low palatability. Forage can be improved in most areas by seeding with adapted grasses. Seeding is practical, however, only on low-producing areas that are in fair or poor condition.

Total annual production of air-dry forage on this site ranges from 2,200 pounds in years of favorable moisture to 1,800 pounds in years of unfavorable moisture.

South Slope Range Site

The soils of this range site are steep to very steep stony loams that formed in material weathered from basalt. They are on exposed slopes that face south and west at an elevation of 1,100 to 4,000 feet along the Clearwater River and inside canyons. Small areas of deep soils are included in this site, but they seldom make up more than 10 percent of the total acreage. Solid rock crops out in places. The average annual precipitation is 21 to 28 inches.

Runoff is rapid to very rapid on these soils, and the erosion hazard is severe to very severe. The water-holding capacity is low to moderate.

The climax vegetation is a plant community in which Idaho fescue, bluebunch wheatgrass, and prairie junegrass produce 75 to 85 percent of the total herbage. Forbs, such as arrowroot balsamroot, lupine, wild carrot, biscuitroot, yarrow,

Indian paintbrush, and penstemon are also present in the community. The principal shrubs are rose and snowberry, and they occur only as scattered plants.

This range site generally has been badly overgrazed. The present cover consists of annual grasses, scattered remnants of perennial grasses, and annual forbs. Proper grazing use and other good range management are needed for improving the plant cover and increasing forage production. Because of the slopes and rocks, however, preparing a seedbed for the necessary reseeding is not feasible.

Total annual production of air-dry forage on this site ranges from 1,500 pounds in years of favorable moisture to 1,100 pounds in years of unfavorable moisture.

Granitic South Slope Range Site

The soils of this range site are shallow, steep to very steep droughty sandy loams that are well drained. These soils formed in material weathered from quartz monzonite, granite, or similar acidic rock. They are at an elevation of 1,100 to 3,700 feet. Slopes face south and west. Runoff is very rapid on these soils, and the erosion hazard is very severe. The average annual rainfall is 21 to 27 inches.

The potential climax vegetation on these soils is perennial grasses and forbs and a few ponderosa pine. The principal perennial grass is bluebunch wheatgrass. Prairie junegrass is also present but is less abundant. When the site is in excellent condition these two grasses provide 80 to 85 percent of the herbage. Forbs of the climax community are arrowleaf balsamroot, lupine, yarrow, wild carrot, biscuitroot, and sunflower. Shrubs are not common on this range site, but rabbitbrush invades severely depleted areas.

This range site has been severely abused. Perennial grasses that were in the original plant community are now only in protected areas. Most of the forbs are still present in varying amounts. Annual bromegrasses and annual fescues are now the major grasses. Invaders on this site are goatweed, wild lettuce, tarweed, groundsmoke, thistle, and mullein.

Total annual production of air-dry forage on this site ranges from 1,100 pounds in years of favorable moisture to 700 pounds in years of unfavorable moisture.

Granitic Range Site

Yakus coarse sandy loam, 12 to 40 percent slopes, is the only soil in this range site. It formed in material weathered from quartz monzonite, and related rocks. This soil is shallow to weathered bedrock. It is on slopes below areas of soils in the Granitic South Slope range site. The average annual precipitation on this site is 21 to 27 inches.

The surface layer of this soil absorbs moisture at a moderate to moderately rapid rate. The erosion hazard is severe.

The climax vegetation on this site consists of perennial grasses and forbs. Bluebunch wheatgrass is dominant in the community, but prairie junegrass is also common. Among the forbs are arrowleaf balsamroot, lupine, wild carrot, yarrow, biscuitroot, and sunflower. Generally no shrubs are present. Scattered, poorly formed ponderosa pine trees that have a crown density of less than 10 percent grow in places.

Most of this site is in poor to fair condition. The vegetation consists mostly of annual bromegrasses and annual fescues. Canada bluegrass has invaded some areas. Remnant plants of most of the forbs in the climax stand grow even in the poorer locations. Invaders on this site are goatweed, China-lettuce, tarweed, kitchenweed, thistle, and mullein.

Total annual production of air-dry forage on this site ranges from 1,400 pounds in years of favorable moisture to 1,100 pounds in years of unfavorable moisture.

Practices for Rangeland

The greatest amount of forage is produced on range that is in good or excellent condition. Several principles of management apply to range on all soils, and these are discussed in the paragraphs that follow.

Proper grazing use.--Proper grazing is the most important of all range practices. Without this practice, all other practices fail.

All food used by a plant for its growth is manufactured in its leaves. For this reason grazing or mowing needs to be limited so that enough leaf surface remains to keep this important process in operation. A general rule to follow is to graze not more than half of the total year's growth. Bunchgrasses are examples of grasses that can safely be grazed up to 50 percent of their total season's growth.

Plants that are grazed heavily are weakened because they cannot produce and store the necessary plant food before the dormant season. Plants that are grazed least grow the best because more light, water, and nutrients go to the plants that have the most leaf surface. Thus, without sound grazing management, the least palatable plants remain strong and replace the more palatable plants.

Proper use year after year can be realized only if the size of the herd and the length of the grazing period are balanced with yearly forage production. Consequently on range in good or excellent condition, spring grazing should be delayed until the bunchgrasses are 4 to 6 inches high and the soil is dry enough to prevent damage from trampling. Range in poor or fair condition generally needs special treatment, depending on the objective of management. The rancher can consult local representatives of the Soil Conservation Service for onsite assistance.

Grazing systems.--These are systems of grazing in which pastures are rested at planned intervals.

Each spring or summer grazing unit is rested for the entire growing season once in a cycle of 3, 4, or 5 years. Four pastures, or units, of about equal grazing capacity are desirable. In these systems one or more pastures, or a grazing unit made up of two or more pastures, is deferred for the entire growing season. During the deferred period, the plants build up a full reserve of plant food. The mature forage can then be used in fall.

If these systems of grazing are carried out properly and the pastures are properly used, maximum improvement will result. Improvement of range in the South Slope range site and in the Granitic South Slope range site can be carried out only under proper grazing management.

Fencing.--Boundary fences are required to control the grazing use of a given range. Internal or cross fences generally are needed to divide the range so that grazing systems can be used. Internal fences also are needed to obtain proper distribution of stock and proper use of all forage.

Water development.--The availability and distribution of water in each grazing unit are often the factors that determine the use of the forage. The distance away from water that livestock graze varies greatly with the terrain. On level to gently rolling soils, cattle sometimes graze a mile or more away from water. On rough, steep soils, one-half mile may be too far. If feasible, a facility that provides clean water should be located at intervals of 1/2 to 1 mile in steep areas. All watering facilities should be so constructed that they minimize the possibility of the spread of infectious diseases.

Salting.--Livestock must always have access to an adequate supply of salt so they can make suitable gains in weight and remain healthy. Salt stations that are properly located away from water aid materially in obtaining good distribution of livestock and even use of forage plants. Moving the salt from one station to another helps to obtain even use of the grazing unit.

Noxious weed control.--The weeds in the survey area that are toxic to livestock are goatweed, short and tall larkspurs, water hemlock, death camas, and lupine. It is necessary to control or eliminate these weeds to keep losses of stock at a minimum.

Larkspur and deathcamas generally occur in the survey area as scattered plants, and it therefore is not practical to eradicate them. Ranchers need to recognize that these plants are a threat to their animals. Livestock should not be turned out on native range until the forage plants have grown enough to supply adequate pasture. Toxic plants, such as larkspur and deathcamas, are most frequently grazed when desirable forage is lacking.

Water hemlock grows in areas scattered along streams and around springs. This plant should be dug out, and all parts of it should be burned. Selective sprays are only effective against it early in spring. The plant is deadly to all kinds of livestock. Generally the animals eat it in over-grazed pastures, but they have been known to nibble it even when desirable forage was plentiful.

Lupine provides forage for cattle and sheep while it is growing, and is toxic when the beans are in the pods. Since the seeds shatter soon after they mature, the chance of this plant becoming troublesome is remote.

USE OF THE SOILS AS WOODLAND[4]

More than three-fourths of the Kooskia Area was forested when the first settlers came to the Area. Cutting of the timber began about 1863 and has continued until the present. Some of the trees were cut for lumber. Many areas on the more gentle and more accessible slopes to the west, however, were cleared for farming. Clearing of privately owned woodland for farm crops or pasture is still taking place.

Today about 63 percent of the Area is woodland. About four-fifths of the acreage is within the boundaries of the Clearwater and Nez Perce National Forests. The woodland outside the national forests is owned or managed by the Idaho State Forestry Department, the Bureau of Indian Affairs, and private owners.

The woodlands provide saw timber, fence posts, fuel, and other wood products. They furnish employment for many resident and nonresident workers. Much of the timber is processed locally or in plants at Lewiston.

In addition to their value as a source of wood products, the woodland provides grazing for large numbers of livestock and habitat for wildlife. Also, the source of much of the water that makes farming, ranching, and urban communities possible in the lowlands is in the wooded areas. The cover of trees, shrubs, and herbaceous plants in wooded areas also helps to prevent damaging floods and helps to reduce the amount of silt in reservoirs. Furthermore undisturbed wooded areas have great scenic beauty. They attract many visitors and have high recreational value.

Kinds of trees.--At lower drier elevations in the Area, ponderosa pine and Douglas-fir are predominant in the woodland. Grand fir, western redcedar, and western white pine are predominant at moister medium elevations, and Englemann spruce and subalpine fir are predominant at higher elevations. Each of these trees varies in abundance at different parts of its altitudinal range and is lacking in some places. Other conifers in the survey area are western larch, lodgepole pine, and Pacific yew. Some of the broadleaf trees are black cottonwood, quaking aspen, alder, and birch.

Ponderosa pine is abundant and is widely distributed throughout the survey area. This tree grows in relatively small, even-aged stands. The stands are interspersed with treeless stretches or occur in widely scattered stands within areas of grassland. In the somewhat higher, more moist areas, ponderosa pine and Douglas-fir grow in the same stands. Ponderosa pine, however, requires less moisture than Douglas-fir and occupies the drier, more exposed slopes. In the Kooskia Area, the most productive stands of ponderosa pine are at elevations of 2,500 to 3,000 feet on plateaus, rolling uplands, and on slopes that face south and west. In these places competition from other trees is not so severe as in other areas. Ponderosa pine grows well on soils of the Kooskia (pl. IV), Sallyann, and Weedmark series. It is a minor tree at medium elevations where the woodland is predominantly grand fir on such soils as those in the Caribel, Greencreek, Molly, and Suttler series.

Douglas-fir has more exacting moisture requirements than ponderosa pine. Where the two species grow together, Douglas-fir commonly is on the higher, more moist, and more sheltered slopes. In the higher mountainous part of the Area, Douglas-fir is mixed with grand fir, western larch, western white pine, western redcedar, and Pacific yew. Douglas-fir grows well on Kooskia soils (pl. IV). This tree also grows well on Helmer, Jughandle, Suttler, and Weedmark soils and on the loamy variant of the Helmer series.

Grand fir grows throughout the survey area in pure stands or, more commonly, as an important part of mixed coniferous forests. It reaches its maximum stand density at elevations between 4,000 to 5,000 feet, but it also grows well at lower elevations. Grand fir is suited to Brody, Helmer, Caribel, Lochsa, Molly, and Suttler soils. Among the common associates of grand fir are Douglas-fir, western redcedar, western white pine, western larch, and Pacific yew. At elevations above 5,000 feet, grand fir grows in stands that are dominated by subalpine fir and Englemann spruce.

Western redcedar is an important part of the forest cover at medium and higher elevations. It commonly is mixed with grand fir in moist areas. North of the Middle Fork Clearwater River, the mixture includes western white pine; south of the river, no white pine is in the stands. Western redcedar and western white pine grow well in deep, moist, soils on stream bottoms, cool slopes, and in gulches and ravines. Among the soils that are suited are those of the Helmer, Jughandle, Molly, and Suttler series.

Englemann spruce and subalpine fir are dominant in wooded areas at elevations above 5,000 feet. Their main associates are grand fir, western redcedar, Douglas-fir, western larch, and lodgepole pine. Jughandle soils and the loamy variant of the Helmer series are in these higher areas.

Western larch, lodgepole pine, and Pacific yew are minor and less valuable conifers in the survey area. Western larch is a deciduous tree that grows at medium and higher elevations. Lodgepole pine grows in even-aged stands or is mixed with other conifers at the higher elevations. This tree grows rapidly and can be used to restock burned-over areas. Pacific yew generally grows in the understory as a tree or as a large shrub in mixed stands of conifers.

Yield information.--Soils vary in their ability to produce trees. Depth, fertility, texture, and available water capacity, influenced by elevation, aspect, and climate, determine the kinds of trees

[4] By Melvin R. Carlson, woodland conservationist, Soil Conservation Service.

that can be expected on any site. Available water capacity and the depth of the root zone are of major importance. Elevation of the soil and the direction that slopes face are of particular importance in the Kooskia Area.

The potential productivity of a soil for a specified kind of tree is expressed as site index. Site index is the average height, in feet, of the dominant and codominant trees of a given species at a specified age. These are the taller trees, the crowns of which form the general level of the woodland canopy and occasionally extend above it. In this survey the age for ponderosa pine and Douglas-fir is 100 years, and for grand fir and western white pine it is 50 years. Site indexes, however, commonly are used to assess the quality of stands that are less than 50 years old or are more than 100 years old.

Site class represents a grouping of site indexes within a defined range for a species, or a combination of species of trees. The site index and site class ratings given in this survey are based on field studies made by soil scientists and woodland conservationists; on experience of foresters, woodland owners, and others who have observed yields of wood crops in the survey area; and on studies of similar soils in adjacent areas. No western white pines large enough to be of value in a study of site quality are in the Area, and available data were used in place of specific site indexes.

The relationship between site classes and site indexes of ponderosa pine, Douglas-fir, grand fir, and western white pine are useful in understanding the relative quality of a site. Site class ratings are normally designated as 1, 2, 3, 4, and 5, or as used in the listing that follows, as excellent, good, fair, poor, and very poor, respectively, to show the relative quality of a site.

Forest species and productivity ratings	Site index range
Ponderosa pine and Douglas-fir:	
Excellent	More than 112
Good	112 to 99
Fair	98 to 85
Poor	84 to 71
Very poor	Less than 36
Grand fir and western white pine:	
Excellent	More than 65
Good	65 to 56
Fair	55 to 46
Poor	46 to 36
Very poor	Less than 36

Average yields that can be expected per acre from fully stocked, even-aged unmanaged stands of ponderosa pine on soils of various site indexes (8) are shown in figure 2. The information in this figure can also be used to determine average yields per acre for Douglas-fir because the relation between site index and yield is similar for the two species. In this figure the yields in board feet are for trees 11.6 inches in diameter and larger; yields in cubic feet are for trees 0.6 inch in diameter and larger.

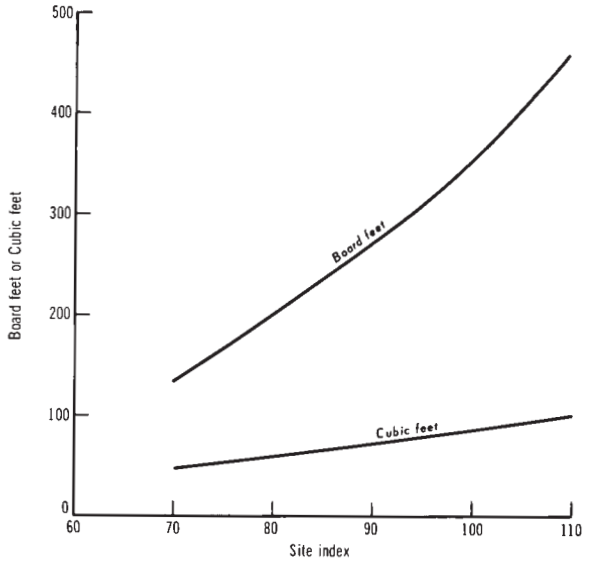

Figure 2.--Average annual acre yield for even-aged, fully stocked, unmanaged stands of ponderosa pine at 100 years of age.

Average yields per acre from fully stocked, even-aged, unmanaged stands of western white pine and grand fir that grow in various types of soils (7) are shown in figures 3 and 4. In figure 3 the yields are for trees 12.6 inches in diameter and larger, but in figure 4, the yields are for trees 0.6 inch in diameter and larger.

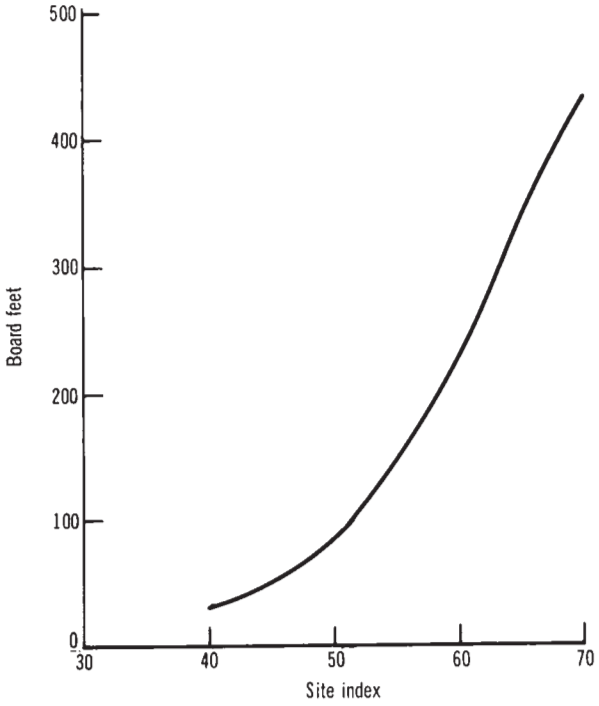

Figure 3.--Average annual yield in board feet per acre, Scribner rule, for even-aged, fully stocked, unmanaged stands of western white pine at 80 years.

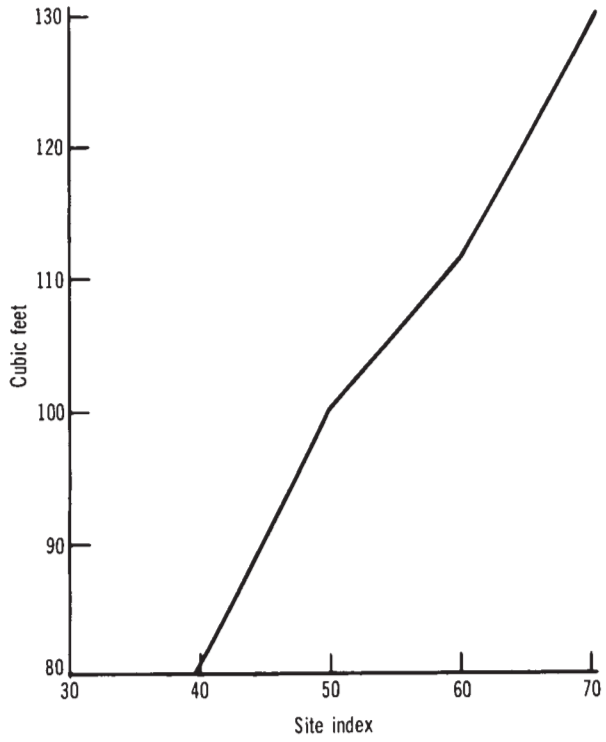

Figure 4.--Average annual yield in cubic feet per acre for even-aged, fully stocked, unmanaged stands of western white pine at 80 years.

Woodland Groups

The woodland soils of the Kooskia Area have been placed in groups on the basis of their suitability for trees. Each group is made up of soils that produce similar kinds of wood crops, need similar management, and have about the same productivity. Only the soils used for woodland have been placed in woodland groups. The names of the soils in each group are listed in the "Guide to Mapping Units" at the back of this survey.

For each group the predominant species are given, and productivity ratings based on site index (see the discussion of yield information) are shown. Changes in the demand for various woodland products, in the condition of the trees that make up a stand, and in the needs and desires of owners all bring about changes in the relative value of trees. No attempt therefore has been made to list the species of trees in order of preference.

Important parts of the descriptions of the woodland groups are verbal ratings for risk of competition from other plants, hazard of seedling mortality, limitations to use of equipment, and hazard of erosion. These ratings are always slight, moderate, or severe. The following explanations of these ratings apply to the descriptions of all woodland groups in the Kooskia Area.

Plant competition is rated on basis of the degree to which unwanted plants invade openings in the tree canopy. It is slight if unwanted plants present no special problem; moderate if the invaders delay but do not prevent establishment of a normal, fully stocked stand; and severe if trees cannot regenerate naturally.

Seedling mortality refers to the expected degree of mortality of planted seedlings as influenced by kinds of soil when plant competition is not a limiting factor. A rating of slight indicates an expected loss of less than 25 percent of the planted seedlings; of moderate, a loss of 25 to 50 percent of the seedlings; and severe, a loss of more than 50 percent of the seedlings.

Equipment limitations are rated on basis of soil characteristics that restrict or prohibit the use of equipment commonly used in tending and harvesting the trees. In the Kooskia Area soil characteristics having the most limiting effect are texture, drainage, slope, and stoniness. Slight means there is no restriction in the kind of equipment or the time of year it is used; moderate means that use of equipment is restricted for less than 3 months of the year and that some kinds of equipment would injure tree roots or damage soil structure; and severe means equipment cannot be used more than 3 months a year and that use of equipment would severely damage tree roots or soil structure and stability.

Erosion hazard refers to the potential hazard of soil losses in woodland if the plant cover is disturbed by equipment or fire. The hazard is slight if expected soil losses are small; moderate if some soil losses are expected and care is needed during logging and construction to reduce soil losses; severe if special methods of operation are necessary for preventing excessive soil losses.

Woodland Group 1

In this group are nearly level to hilly soils on dissected uplands, plateaus, and terraces. The surface layer is friable or very friable silt loam or loam, and the subsoil is silty clay or clay loam.

Permeability is slow or moderately slow in these soils. Bedrock at a depth of 4 1/2 feet or more restricts growth of roots and penetration of water. The content of organic matter in the soils is moderate to high, and the supply of natural plant nutrients is moderately low to high.

Ponderosa pine and Douglas-fir are the predominant trees on these soils. Ponderosa pine requires more sunlight than Douglas-fir for adequate restocking. Volunteer stands of Douglas-fir, which tolerates shade better, therefore reproduce more readily than volunteer stands of ponderosa pine.

Productivity of trees on these soils is good. The average site index for ponderosa pine and Douglas-fir is 104. A fully stocked unmanaged stand at the age of 100 years yields about 36,100 board feet per acre. The average annual growth is about 361 board feet per acre.

Plant competition is moderate. It delays natural regeneration of trees, but it does not prevent establishment of an adequate stand.

Mortality of seedlings is slight or moderate. Some preparation of the seedbed helps to speed the establishment of a satisfactory stand, especially if seedlings are to be planted. Preparation of the site is needed where seedling mortality is moderate, and replanting is needed in places.

Equipment limitation is moderate. Gullies form in skid trails and roads if equipment is used on the steeper soils.

The hazard of erosion is slight to severe. Special care is needed in the construction and maintenance of roads, skid trails, and landings to control gullying.

Woodland Group 2

In this group are nearly level to steep, deep and very deep, well-drained soils on dissected plateaus. The surface layer is very friable reddish-brown silt loam, and the subsoil is friable to firm reddish-brown silty clay loam or clay loam.

Permeability is moderately slow in the subsoil. The content of organic matter is moderately high to high, and the supply of natural plant nutrients is moderate. The available water capacity is high.

Grand fir, Douglas-fir, and ponderosa pine are the dominant trees on these soils. Grand fir grows readily in the shade, and therefore restocks openings in wooded areas more rapidly than trees that have a higher market value.

Productivity of trees on these soils is good, and the average site index for grand fir is 59. A fully stocked unmanaged stand at the age of 80 years yields about 17,900 board feet per acre. The average annual growth is about 224 board feet per acre.

Plant competition is slight to severe. It prohibits the natural regeneration of ponderosa pine and white pine. Prescribed burning, clearing, disking, brush cutting, and the use of chemicals are among the special practices needed for control of competing plants.

Seedling mortality is slight. Development of a good stand normally requires the planting of seedlings and the control of competing plants. No special management is needed, however, to obtain natural regeneration of a mixed stand of conifers predominantly of grand fir.

Equipment limitation is severe, and the use of heavy equipment is restricted for periods of 3 months or longer. Traction is poor when the soils are moist, and the surface becomes badly rutted if equipment is used during the rainy season. Equipment can be used effectively only during the dry summer months.

The hazard of erosion generally is slight to severe, depending on the steepness of the slope. These soils are in areas of moderate rainfall. Because of the erosion hazard, roads and skid trails must be carefully located, built, and maintained.

Woodland Group 3

Brody cobbly silt loam, 35 to 65 percent slopes, is the only soil in this group. It is a moderately deep soil on mountains. Slopes generally face north. This soil is cobbly or gravelly in the surface layer and subsoil. It is underlain by fractured bedrock.

Permeability is moderate in this soil. Roots grow readily in this soil material and penetrate the fractures in the underlying bedrock. The content of organic matter is moderate, and the supply of plant nutrients is good. Available water capacity is low.

Grand fir, Douglas-fir, western larch, ponderosa pine, and western white pine are the predominant trees on this soil. Associated with them on more moist sites are western redcedar and Engelmann spruce.

Productivity of trees on this soil is good, and the average site index is 59. A fully stocked unmanaged stand at the age of 80 years yields about 17,900 board feet per acre. The average annual growth is about 224 board feet per acre.

Plant competition is moderate or severe. Where it is moderate it delays regeneration but does not prohibit the establishment of fully stocked stands of desirable species. Preparation of the site is necessary in places in areas of moderate competition. It helps both the planted and the natural seedlings. Where competition is severe, the undesirable plants must be controlled before an adequate stand can be developed.

Seedling mortality of grand fir and western redcedar is not a problem. These species reestablish readily in shaded areas. Douglas-fir can be

maintained as the dominant species in a stand if a seed source is available and if the competition from seedlings of grand fir is not severe.

Because of the steep and very steep slopes, equipment limitations are severe. Road building is difficult. The erosion hazard also is severe.

Woodland Group 4

This group consists of hilly to very steep soils in canyons at low elevations and on slopes that face south at higher elevations. These soils have a surface layer of loam or silt loam. They are moderately deep to basalt or metamorphic bedrock. Rock outcrops range from few to many, and some of the soils are stony.

Water moves through the subsoil of these soils at a moderate or moderately slow rate. The content of organic matter in the surface layer is moderate to high, and the supply of natural plant nutrients is moderate. Roots of trees penetrate into the fragmented bedrock. Available water capacity is moderate.

Ponderosa pine and Douglas-fir are the predominant trees on these soils. Productivity is good, and the average site index for ponderosa pine and Douglas-fir is 104. A fully stocked unmanaged stand at the age of 100 years yields about 36,100 board feet per acre. The average annual growth is about 361 board feet per acre.

Plant competition is slight to severe. Competition from invading shrubs and trees generally prevents establishment of an adequate stand of ponderosa pine. Prescribed burning, brush cutting, and the applying of chemicals aids in restocking the ponderosa pine. Where a source of seed is available, Douglas-fir readily restocks itself.

Seedling mortality is moderate on these soils. Replanting is needed in places to fill in open areas.

Because of the slopes, rocks, and stones, the equipment limitation is very severe. The erosion hazard is moderate to severe. Special care therefore is needed in locating roads and skid trails and in carrying out management and harvesting operations.

Woodland Group 5

This group consists of steep and very steep soils that have a surface layer of sandy loam and a subsoil of gravelly coarse sandy loam. Depth to bedrock of granite, gneiss, or mica-schist is 40 to 80 inches.

Permeability is moderately rapid in these soils. The content of organic matter is moderately high to high in the surface layer, and the supply of plant nutrients is moderate. Roots of trees penetrate the soil material to the bedrock, and in places they penetrate cracks in the bedrock.

Ponderosa pine and Douglas-fir grow in pure or mixed stands in these soils. Productivity is good, and the average site index is 104. A fully stocked unmanaged stand at the age of 100 years yields about 36,100 board feet per acre. The average annual growth is about 361 board feet per acre.

Plant competition is severe for ponderosa pine. Grass, brush, and invader plants should be controlled before seedlings are planted.

Seedling mortality is severe. The supply of soil moisture during the hot summer months is fairly low. Early planting, mulching, and shading of seedlings are among the special practices required for obtaining an adequate stand. Much replanting also is necessary.

Because of steep and very steep slopes, equipment limitations are severe. Erosion is a severe or very severe hazard, depending on slope.

Woodland Group 6

This group consists of sloping to steep soils on uplands. These soils formed in material weathered from quartz monzonite or similar bedrock. The surface layer is loam or silt loam, and the subsoil is clay loam or sandy clay loam.

Permeability is moderately slow in these soils. The content of organic matter is moderately high or high in the surface layer, and the supply of plant nutrients is moderate. Roots of trees penetrate to bedrock. Available water capacity is moderate.

Wooded areas on these soils consist of ponderosa pine and Douglas-fir. Productivity is fair, and the average site index is 93. A fully stocked unmanaged stand at the age of 100 years yields about 27,200 board feet per acre. The average annual growth per acre is about 272 board feet.

Plant competition is severe. Brush prevents the natural regeneration of adequate stocks of ponderosa pine. Prescribed burning, land clearing, disking, brush cutting, and the application of herbicides are needed before ponderosa pine seedlings can be planted. A fair to good stand of Douglas-fir is obtained through natural regeneration.

Seedling mortality in planted stands of ponderosa pine generally is moderate. Replanting of open areas is needed in places.

Equipment limitation is slight to severe. The erosion hazard is slight to severe, depending on slope. Road building, harvesting, and other operations that disturb the plant cover should be on the contour, especially on the steeper slopes.

Woodland Group 7

This group consists of deep and very deep, nearly level and undulating to hilly and steep soils. These soils are on uplands at a moderately high altitude. They are somewhat poorly drained to well drained. The upper layers formed mostly in windlaid silty material.

Permeability of the lower part of the subsoil is slow or moderately slow in these soils. The supply of plant nutrients is moderate or moderately low. Available water capacity is high.

Productivity of trees on these soils is excellent, and the average site index is 68. A fully stocked unmanaged stand at the age of 80 years yields about 34,600 board feet per acre. The average annual growth is about 432 board feet per acre.

Plant competition is slight to severe. It delays the natural regeneration of western redcedar and grand fir and slows their initial growth, but it does not prevent these trees from becoming established. The competition from invading plants is severe for western white pine. This tree cannot reestablish itself unless the competing plants are controlled. Prescribed burning, the applying of herbicides, and other special practices are needed. The natural regeneration and growth of mixed stands generally are not impeded by undesirable plants.

Seedling mortality is slight to moderate. The mortality of white pine seedlings is moderate, and site preparation is necessary for adequate restocking.

Long winters and deep snow restrict the use of equipment on these soils to about 5 months each year.

The hazard of erosion varies with slope. It is slight on slopes of 0 to 5 percent, and severe on slopes of 20 to 45 percent. On the steeper slopes all operations that disturb vegetation should be on the contour if feasible.

Woodland Group 8

This group consists of deep and very deep, well-drained and somewhat excessively drained, friable soils. These soils are in mountainous areas at high elevations. They formed in material weathered from granite, gneiss, or related bedrock.

Permeability is moderate and moderately rapid in these soils. The supply of plant nutrients is moderate to moderately low. Available water capacity is moderate.

Various mixtures of western redcedar, grand fir, western white pine, western larch, Douglas-fir, lodgepole pine, and ponderosa pine grow in these soils. Ponderosa pine makes up only a small part of the stands. Engelmann spruce and subalpine fir are at higher elevations.

Productivity of trees on these soils is fair to good. The average site index is 45 for white pine and 100 for ponderosa pine. A fully stocked unmanaged stand of grand fir at the age of 80 years yields about 6,500 board feet per acre. The average annual growth is about 81 board feet per acre.

Plant competition is slight to severe. Establishment of western white pine and ponderosa pine is delayed by unwanted plants in some areas and prevented in others. Fully stocked stands of western white pine cannot be obtained unless the invading plants are controlled. Burning or applying chemicals to eradicate the brush is needed. Fair to good restocking can be expected of the trees that can tolerate shade.

Equipment limitation is severe. The use of equipment is restricted to periods late in spring and early in fall. The location of roads and skid trails and the use of equipment should be on the contour wherever feasible.

Erosion is a moderate to severe hazard, depending on the slope.

Woodland Group 9

This group consists of steep and very steep, deep and very deep, well-drained and somewhat excessively drained soils. The surface layer and subsoil are sandy loam. Rocks crop out in a few to many places.

Permeability is moderately rapid in these soils. The content of organic matter is moderately high or high, and the supply of plant nutrients is moderate. Available water capacity is moderate.

The predominant trees on these soils are grand fir, Douglas-fir, western larch, and western white pine. Some species that are less common are western redcedar and ponderosa pine. Grand fir grows well in the shade, and thus remains a major component of the woodland cover. Cedar also persists in the stands. White pine and ponderosa pine are not so abundant as the other trees, because they cannot obtain enough sunlight to restock satisfactorily. Douglas-fir reestablishes itself if a suitable source of seed is available and if competition from grand fir is not severe.

Productivity of trees on these soils is fair, and the average site index is 52. A fully stocked unmanaged stand at the age of 80 years yields about 6,500 board feet per acre. The average annual growth is about 81 board feet per acre.

Plant competition is severe. Invading shrubs delay natural regeneration of white pine and ponderosa pine but not enough to prevent establishment of an adequate stand. Preparation of the site and other special practices are not needed.

Seedling mortality is severe, and replanting is difficult because most areas of these soils are inaccessible.

Equipment limitation is severe because the steep and very steep slopes prevent the use of many kinds of equipment. The erosion hazard is severe or very severe, depending on the slope.

Woodland Group 10

This group consists of hilly or moderately steep to very steep, deep and very deep soils. These friable soils are well drained or somewhat excessively drained. They are in cool and moist areas where the winters are long and the snow is deep.

Permeability is moderately rapid in these soils. The available water capacity is moderately high.

Western redcedar, western white pine, grand fir, Douglas-fir, lodgepole pine, and ponderosa pine are

the predominant trees. Ponderosa pine grows as individual trees and in scattered patches. It is only a minor species in the stands.

Productivity of trees on these soils is good, and the average site index is 64. A fully stocked unmanaged stand at the age of 80 years yields about 17,900 board feet per acre. The average annual growth is about 224 board feet per acre.

Plant competition is severe for western white pine. Prescribed burning of undesirable plants and the application of chemicals are needed to prepare sites for planting and to provide for natural regeneration. Plant competition is not a special problem for the other trees that grow on these soils.

Because of the heavy snows and long winters equipment limitation is severe. Roads can only be used in summer.

The erosion hazard is moderate to severe, depending on the slope. Rills and gullies form quickly if the protective cover is disturbed. Adequate drainage, proper ditching, and suitable water barriers must be used to control soil loss. Also, roads and skid trails must be carefully located and properly maintained.

Use of the Soils for Wildlife[5]

The Kooskia Area supports many kinds of wildlife. Big game animals, smaller mammals, and birds occupy most parts of the Area at one season or another. Game fish are common in the streams.

White-tailed deer, mule deer, elk, and black bear are the most numerous big game animals. White-tailed deer like to live at the lower elevations, and mule deer and elk generally prefer the higher elevations. Black bear frequent all parts of the survey area, and a few moose also are present. Among the more common smaller mammals are coyotes and weasels. A few mink, marten, and beaver are also in the survey area.

Pheasants and ruffed grouse are the main upland game birds in the cultivated fields and in the adjacent brushy areas. Ruffed grouse are also common in the forested areas, and a small number of blue grouse and Franklin's grouse are in the forests at high elevations.

Rainbow, cutthroat, and Dolly Varden fresh-water trout and whitefish frequent the Middle Fork Clearwater River. Two species of sea-run fish, the Chinook salmon and steelhead trout, use the larger streams of the survey area as spawning grounds. These fish attract sports fishermen to the Kooskia Area from all parts of the country.

The food and cover and supplies of water that make up the wildlife habitat are the main factors to be considered in managing wildlife. The survival of the species during critical periods depends chiefly on the amount and quality of these primary necessities. Among the practices used to restore or improve the existing wildlife habitat are aerial spraying with herbicides; controlled burning; and ways of cutting timber that make openings in unbroken, dense stands of trees. Planting shrubs, grasses, and legumes increase the available supply of food.

Many practices that contribute to the proper management of cropland, native range, and woodland also benefit wildlife. Among these are (1) protecting wooded areas and rangeland from uncontrolled fire; (2) protecting the range from improper use; (3) selecting methods of cutting timber that favor wildlife; (4) locating roads away from streambanks to reduce the hazard of water pollution; (5) maintaining plant cover along streams; and (6) establishing plants that provide food and cover in the borders of woods, fields, and pastures.

Good watershed management is the most important factor in making the streams more suitable for fish. In addition special management practices are needed that increase the population of certain species and improve their habitat. The once common Chinook salmon, for example, is now scarce. A major restocking program is being conducted to help reestablish this species. Additional spawning areas also have been provided by removing barriers that impede migration.

Wildlife Habitats

The kinds of wildlife that frequent a certain place depend upon the kinds of plants that grow. The vegetation, in turn, is influenced by the soils, the climate, differences in elevation, and other factors. In the Kooskia Area, three distinct transitional kinds of plant cover occur, and they are associated with a specific range in elevation and precipitation. The soils of the survey area therefore have been grouped into three wildlife habitats. Each habitat is made up of soils of two or more soil series, and each is associated with a specific range in elevation.

In the paragraphs that follow, the three wildlife habitats in the survey area are described. The main soil series are listed in each, and facts about the plant cover and kinds of wildlife are given. More detailed information about the soils can be obtained from the sections "Descriptions of the Soils" and "Formation and Classification of Soils," as well as in other parts of the survey.

Low elevation habitat.--In this habitat elevation ranges from about 1,200 to 3,000 feet. The vegetation is of a wide variety. Much of the acreage is wooded, but large areas are range or are dryfarmed. The soils are mainly those of the Gwin, Klicker, and Kooskia series, though soils of the Sallyann and Yakus series are also in this habitat.

The woodland is dominantly ponderosa pine and Douglas-fir. These trees grow in pure and mixed stands. The understory is made up of snowberry, ninebark, mountain maple, rose, willow, serviceberry, western thimbleberry, bunchgrasses, and forbs.

Where the natural cover is mainly range plants, the common species are bluebunch wheatgrass, Idaho

[5] By Oscar Mueller, soil scientist, U.S. Forest Service.

fescue, Sandberg bluegrass, annual bromes and fescues, and other species. In cultivated areas, alfalfa, clover, and grasses have been planted for pasture and hay. Wheat, oats, peas, and barley are also grown.

This habitat provides important winter range for deer. The brush fields, wooded areas, and open rangeland provide forage suited to animals that browse and graze.

Controlling the undesirable shrubs is an important management requirement. Management practices that increase the grazing and watershed value also benefit the wildlife.

Middle elevation habitat.--This habitat consists mainly of coniferous woodland. The elevation ranges from about 2,000 to 5,000 feet. The dominant soils are mainly those of the Brody, Caribel, Helmer, Lochsa, Molly, Potlatch, and Suttler series. The noncalcareous variants from the Colville series also are in this habitat.

The trees are dominantly western redcedar and grand fir. Western redcedar is mostly on moist areas on slopes that face north. Grand fir grows mostly on dry ridgetops and on slopes that face south. Other trees in this habitat are western larch, ponderosa pine, Douglas-fir, and western white pine.

The understory contains many shrubs and forbs and a few species of grass. Snowberry, rose, twinflower, western thimbleberry, and huckleberry grow in all parts of the habitat. Ninebark and ocean-spray grow at a lower elevation in the zone, and myrtle pachistima occurs at the higher elevation.

Among the forbs, adenocaulon, false solomonseal, clintonia, and beargrass grow throughout the habitat. Trillium and violet are associated mostly with western redcedar. The grass cover is sparse.

Part of this habitat is range for elk and deer. The availability of browse species for these animals varies considerably because of fluctuations in the climate.

In some places where openings in the forest canopy have been made during logging, a marked increase has occurred in the herbaceous and shrubby cover. The openings, especially those at the lower elevation, are being invaded by undesirable shrubs. Control of these shrubs is a major problem. Control of stream pollution from erosion along many of the roadways also is needed.

High elevation habitat.--This habitat is at an elevation of 5,000 feet. The soils are mainly those of the Jughandle series and the loamy variants from the Helmer series.

The vegetation is dominantly Englemann spruce, lodgepole pine, and subalpine fir. These trees grow in mixed or pure stands. Minor trees in the stands are Douglas-fir, western redcedar, and grand fir. Many small meadowlike openings are in the forests.

Much of the natural cover consists of shrubs and herbaceous plants. In stands of lodgepole pine, the understory is commonly made up mostly of huckleberry or beargrass. Myrtle pachistima are abundant in places. Rose, false solomonseal, trillium, violet, and pinegrass also are common. Dense stands of menziesia cover some areas, but these have little practical value for wildlife.

This habitat provides summer range for big game. It also is a habitat for grouse.

Much of the acreage in this habitat is federally owned. Management for wildlife consists mainly of manipulation of the native vegetation. Important practices are the maintenance of grassy meadows and the use of cutting methods in the forests that best serve the needs of the wildlife. Selective cutting opens the forest canopy and promotes the growth of grasses, forbs, and other plants that provide food for wildlife. Clear cutting in small areas can be used to extend the meadowlike openings in the forests.

Proper surfacing of roads in this habitat is difficult because of the lack of good materials. Road drainage and the stabilization of cut and fill slopes are needed for reducing erosion and decreasing the amount of pollution in the streams.

Use of the Soils for Recreation[6]

The Kooskia Area provides recreation for many who come to the Area to camp and picnic, to hike along the mountain trails, to fish in the streams, to hunt game, to enjoy the scenic woods and mountains, or to just rest and relax. The demand for campgrounds, for parks, play areas, and other recreational developments thus is increasing.

In selecting a site for recreational use, the limitations of the soils in each site must be determined. Some of the more common properties affecting the use of the soils for recreational purposes are soil texture and permeability; steepness and direction of slopes; depth to hard rock or the water table; presence of stones or rocks; drainage; and hazards of erosion and flooding. These and related characteristics affect the erodibility of the soils and their tendency to compact under intensive use. They also effect the hazard of windthrow, which is important in wooded areas used for recreation.

In general, nearly level soils are better for picnic areas and campsites than other soils. The soils should be well drained and free of flooding. Loams and sandy loams are preferred. If intensively used, clayey soils compact and become hard and loose sandy soils will not support a cover of grass. Many good picnic areas and campsites are on deep alluvial soils on bottom lands that are free of flooding. In these areas the soils are nearly level sandy loams or loams that are fertile, friable, and well drained. Special care in design and management is needed if recreational areas are placed on soils that are very sandy or clayey; are shallow, steep, or eroded; or have a high water table.

Landscaping, the use of fertilizer and mulch, and the stabilization or surfacing of roads and walks

[6] By Oscar P. Mueller, soil scientist, U.S. Forest Service.

are likely to be needed in areas that are intensively used for recreational purposes. In places a soil stabilizer is needed on soils that are likely to erode. A mixture of pulverized soil, cement, and water that is compacted to high density can be used in places for stabilizing walks, areas used for picnic tables, and other areas that are subject to heavy use. Mulches of various kinds can be used to stabilize newly seeded areas and steep road cuts. Straw, sawdust, and leaves are the materials most commonly used, but asphalt also can be used effectively. Grass, shrubs, and trees can be fertilized if needed.

Table 3 lists the soils of the survey area and rates their degree of limitation for use as campsites, picnic areas, play areas, and paths and trails. The ratings used are slight, moderate, and severe. These ratings are based on soil features only. They do not include such factors as presence of trees, availability of water, and other factors that may be important in selecting an area for the purpose stated and may require investigation at the site being considered. A rating of slight indicates that there are few, if any, limitations for the purpose stated; a rating of moderate indicates that the soil has limitations in use but that it can be used under good management; a rating of severe indicates that the soil has limiting characteristics that make its use for recreational purposes questionable. It may be possible to correct the problems of a soil that has a severe rating, but the cost is likely to be prohibitive.

Each recreational use is defined in the paragraphs that follow, and the properties important in rating the limitations of the soils for such purposes are given.

Campsites.--A campsite is an area that is used intensively for tents and small camp trailers and for outdoor dining. Campsites require little site preparation other than minor shaping and leveling of areas used for tents and parking. The soils must be able to support heavy traffic by people, horses, and vehicles. Considered in rating the soils were slope, texture of the surface soil, number of stones and rocks, susceptibility to flooding or ponding, drainage, depth to water table, and permeability of the soil.

Picnic areas.--A picnic area is used for pleasure outings at which a meal is eaten outdoors. The chief requirement for such areas is good trafficability, and it is assumed that little site preparation is needed. Considered in rating the soils for picnic areas were texture of the surface soil, number of stones and rocks, drainage, depth to seasonal high water table, and susceptibility to flooding or ponding.

Play areas.--A play area is used for playgrounds and for baseball, football, badminton, volley ball, and other organized games. Such an area requires good drainage and a nearly level, firm surface. It needs to be essentially free of rock outcrops, stones, and other coarse fragments. Water needs to be available if the area is one that requires a turf. Considered in rating the soils for picnic areas were texture of the surface soil; slope; content of gravel; number of cobblestones, other stones, and rocks; susceptibility to flooding or ponding; drainage; depth to bedrock and seasonal water table; permeability; and shrink-swell potential.

Paths and trails.--Paths and trails are areas used for cross-country hiking, bridle paths, and other nonintensive purposes that provide for random movement of people. The chief requirement for such areas is good trafficability. The areas are assumed to be for use as they occur in nature and need little excavation. Factors considered in making the ratings were slope, texture of the surface soil, stones and other coarse fragments, susceptibility to flooding, drainage, and shrink-swell potential.

TABLE 3.--RATINGS AND LIMITATIONS OF THE SOILS FOR RECREATIONAL PURPOSES

Soil name and map symbol	Campsites	Picnic areas	Play areas	Paths and trails
Brody cobbly silt loam, 35 to 65 percent slopes: BcE.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Caribel silt loam, 0 to 7 percent slopes: CaA.	Moderate: Moderately slow permeability.	Moderate: Slope-	Slight to moderate: Slope.	Slight.
Caribel silt loam, 7 to 12 percent slopes: CaB.	Moderate: Slope--	Moderate: Slope-	Severe: Slope-----	Slight.
Caribel silt loam, 12 to 25 percent slopes: CaC.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope.
Caribel silt loam, 12 to 25 percent slopes, eroded: CaC2.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope.
Caribel silt loam, 25 to 45 percent slopes: CaD.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Coleville loam, noncalcareous variant: Co.	Moderate: Somewhat poor drainage.	Moderate: Somewhat poor drainage.	Moderate: Somewhat poor drainage.	Moderate: Somewhat poor drainage.
Greencreek loam, 5 to 30 percent slopes: GcC.	Moderate or severe: Slope.	Moderate or severe: Slope.	Severe: Slope-----	Slight or moderate: Slope.
Gwin-Klicker stony loams, 40 to 65 percent slopes: GkE.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Gwin-Mehlhorn stony loams, 12 to 45 percent slopes: GmD.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope.
Gwin-Mehlhorn stony loams, 45 to 65 percent slopes: GmE.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Gwin-Sallyann stony loams, 35 to 65 percent slopes: GsE.	Severe: Slope; stony.	Severe: Slope; stony.	Severe: Slope; stony.	Severe: Slope.
Helmer silt loam, 0 to 7 percent slopes: HeA.	Moderate: Slow permeability; dust problem.	Moderate: Dust problem.	Moderate: Dust problem.	Moderate: Dust problem.
Helmer silt loam, 7 to 12 percent slopes: HeB.	Moderate: Slope; slow permeability; dust problem.	Moderate: Slope; dust problem.	Severe: Slope; dust problem.	Moderate: Dust problem.
Helmer silt loam, 12 to 25 percent slopes: HeC.	Severe: Slope; dust problem.	Severe: Slope; dust problem.	Severe: Slope-----	Moderate: Slope; dust problem.
Helmer silt loam, 25 to 45 percent slopes: HeD.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Helmer silt loam, loamy variant, 5 to 20 percent slopes: HmC.	Moderate to severe: Slope; moderately slow permeability.	Moderate to severe: Slope.	Severe: Slope-----	Slight to moderate: Slope.
Jacknife silt loam, 7 to 12 percent slopes: JaB.	Moderate: Slope; slow permeability.	Moderate: Slope-	Severe: Slope-----	Slight.
Jacknife silt loam, 12 to 25 percent slopes: JaC.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope.
Jacknife silt loam, 12 to 25 percent slopes, eroded: JaC2.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope.
Jacknife silt loam, 25 to 45 percent slopes: JaD.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Severe: Slope.
Jacknife silt loam, loamy variant, 0 to 7 percent slopes: JcA.	Moderate: Dust problem.	Moderate: Dust problem.	Moderate: Dust problem; slope.	Moderate: Dust problem.
Jacknife silt loam, loamy variant, 7 to 12 percent slopes: JcB.	Moderate: Slope; dust problem.	Moderate: Slope; dust problem.	Severe: Slope-----	Moderate: Dust problem.
Jacknife silt loam, loamy variant, 12 to 25 percent slopes: JcC.	Severe: Slope----	Severe: Slope---	Severe: Slope-----	Moderate: Slope; dust problem.

TABLE 3.--RATINGS AND LIMITATIONS OF THE SOILS FOR RECREATIONAL PURPOSES--Continued

Soil name and map symbol	Campsites	Picnic areas	Play areas	Paths and trails
Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded: JcC2.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope; dust problem.
Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes: JmD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes, eroded: JmD2.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Jughandle sandy loam, 12 to 35 percent slopes: JuD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Jughandle sandy loam, 35 to 65 percent slopes: JuE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Klicker rocky silt loam, 12 to 40 percent slopes: KcD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Klicker rocky silt loam, 40 to 65 percent slopes: KcE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Kooskia silt loam, 0 to 7 percent slopes: KoA.	Moderate: Moderately well drained.	Moderate: Moderately well drained.	Moderate: Moderately well drained; slope.	Slight.
Kooskia silt loam, 7 to 12 percent slopes: KoB.	Moderate: Slope; moderately well drained.	Moderate: Slope; moderately well drained.	Severe: Slope; moderately well drained.	Slight.
Kooskia silt loam, 7 to 12 percent slopes, eroded: KoB2.	Moderate: Slope; moderately well drained.	Moderate: Slope; moderately well drained.	Severe: Slope; moderately well drained.	Slight.
Kooskia silt loam, 12 to 25 percent slopes: KoC.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Kooskia silt loam, 12 to 25 percent slopes, eroded: KoC2.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Lochsa sandy loam, 25 to 65 percent slopes: LoE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Lochsa soils, 65 to 90 percent slopes: LsF.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Lochsa-Yakus sandy loams, 30 to 65 percent slopes: LuE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Lochsa-Yakus rocky complex, 30 to 65 percent slopes: LyE.	Severe: Slope----	Severe: Slope; rocky.	Severe: Slope; rocky.	Severe: Slope.
Mehlhorn-Gwin loams, 25 to 45 percent slopes: MgD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Mixed alluvial land: Mn----	Moderate: Floods in spring.	Moderate: Floods in spring.	Moderate: Floods in spring.	Slight.
Molly loam, 12 to 30 percent slopes: MoC.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Molly loam, 30 to 65 percent slopes: MoE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Nicodemus loam, 0 to 7 percent slopes: NcA.	Slight----------	Slight----------	Slight or moderate: Slope.	Slight.
Nicodemus loam, 7 to 12 percent slopes: NcB.	Moderate: Slope--	Moderate: Slope--	Severe: Slope----	Slight.
Potlatch silt loam, 0 to 7 percent slopes: PoA.	Moderate: Somewhat poor drainage; slow permeability.	Moderate: Somewhat poor drainage.	Severe: Somewhat poor drainage.	Moderate: Somewhat poor drainage.
Potlatch-Greencreek loams, 7 to 25 percent slopes: PrC.	Moderate or severe: Slope.	Moderate or severe: Slope.	Severe: Slope----	Slight or moderate: Slope.
Riverwash: Re----------	Severe: Subject to flooding.	Moderate: Subject to flooding.	Moderate: Subject to flooding.	Severe: Coarse texture; subject to flooding.

TABLE 3.--RATINGS AND LIMITATIONS OF THE SOILS FOR RECREATIONAL PURPOSES--Continued

Soil name and map symbol	Campsites	Picnic areas	Play areas	Paths and trails
Rock land: Rk----------	Severe: Steep slope; rocky.	Severe: Steep slope; rocky.	Severe: Steep slope; rocky.	Severe: Steep slope; rocky.
Rock outcrop: Ro----------	Severe: Very steep slope; extremely rocky.	Severe: Very steep slope; extremely rocky.	Severe: Very steep slope; extremely rocky.	Severe: Very steep slope; extremely rocky.
Sallyann stony loam, 30 to 65 percent slopes: SaE.	Severe: Slope; stony.	Severe: Slope; stony.	Severe: Slope; stony.	Severe: Slope.
Suttler loam, 7 to 12 percent slopes: SuB.	Moderate: Slope--	Moderate: Slope--	Severe: Slope----	Slight.
Suttler loam, 12 to 30 percent slopes: SuC.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Suttler loam, 30 to 65 percent slopes: SuE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Weedmark silt loam, 7 to 12 percent slopes: WeB.	Moderate: Slope; moderately slow permeability.	Moderate: Slope--	Severe: Slope----	Slight.
Weedmark loam, 12 to 25 percent slopes: WmC.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Weedmark loam, 12 to 25 percent slopes, eroded: WmC2.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Weedmark loam, 25 to 45 percent slopes: WmD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Yakus coarse sandy loam, 12 to 40 percent slopes: YaD.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Moderate: Slope.
Yakus coarse sandy loam, 40 to 65 percent slopes: YaE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.
Yakus-Lochsa sandy loams, 40 to 65 percent slopes: YlE.	Severe: Slope----	Severe: Slope----	Severe: Slope----	Severe: Slope.

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Engineering Uses of the Soils[7]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, and pipelines, the foundations of buildings, facilities for storing water, structures for controlling erosion, drainage and irrigation systems, and systems for disposing of sewage. Among the properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Also important are depth to water table, depth to bedrock, and relief.

Engineers can use the information in this publication to--

1. Make soil and land use studies that will aid in selecting and developing sites for industries, businesses, residences, and recreational areas.
2. Make estimates of the engineering properties of soils for use in the planning of agricultural drainage systems, farm ponds, irrigation systems, waterways, and other structures for conserving soil and water.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, skid trails, airports, pipelines, and cables and in planning more detailed surveys of the soils at the selected locations.
4. Locate possible sources of sand, gravel, and other materials for use in construction.
5. Correlate performance of engineering structures with the soil mapping units and thus develop information for planning that will be useful in designing and maintaining the structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and of construction equipment.
7. Supplement information from other published maps, reports, and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to a specific area.

Used with the soil map to identify the soils, the engineering interpretations in this section can be useful for many purposes. It should be emphasized, however, that the interpretations made in this survey do not eliminate the need for sampling and testing at a site chosen for a specific engineering work that involves heavy loads or at a site where excavations are to be deeper than the depths of layers here reported. Nevertheless, even in such situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words, for example, soil, clay, silt, and sand, may have special meanings in soil science. These and other special terms used in the survey are defined in the Glossary at the back of this survey. Most of the information about engineering is given in tables 4, 5, and 6.

Engineering Classification Systems

Agricultural scientists of the U.S. Department of Agriculture classify soils according to texture (12). In some ways this system of naming textural classes is comparable to the systems most commonly used by engineers for classifying soils; that is, the system of the American Association of Highway Officials (AASHO) and the Unified system.

Most highway engineers classify soils in accordance with the system approved by the American Association of State Highway Officials (1). In this system soil materials are classified in seven principal groups. The groups range from A-1 (gravelly soils having high bearing capacity, the best soils for subgrade) to A-7 (clayey soils having low strength when wet, the poorest soils for subgrade). Within each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best materials to 20 for the poorest. The group index number for the soils tested is shown in parentheses after the soil group symbol in table 4.

Some engineers prefer to use the Unified soil classification system (15). In this system soil materials are identified as coarse grained, 8 classes; fine grained, 6 classes; and highly organic. Table 4 shows the classification of the tested soils according to the Unified system.

Engineering Test Data

Table 4 gives test data for samples of selected layers taken from the profiles of six of the principal soil series of the Kooskia Area. The samples were taken in representative sites and were tested in laboratories of the Bureau of Public Roads (BPR) in accordance with standard AASHO procedures. The data in the table show the moisture density, mechanical analysis, the liquid limit, and the plasticity index. Also shown is the classification of the samples under the AASHO system and the Unified system.

In the moisture-density, or compaction test, a sample of the soil material is compacted several times with a constant compactive effort, each time at successively higher moisture content. The moisture content increases until the optimum content is reached. After that the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is called "maximum dry density." Moisture-density data are important

[7] By Homer C. Moore, civil engineer, Soil Conservation Service.

in earthwork, for as a rule optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The results of the mechanical analysis, obtained by combined sieve and hydrometer methods, may be used to determine the relative proportions of the different size particles that make up the soil sample. The percentage of fine-grained material, obtained by the hydrometer method generally used by engineers, should not be used in determining textural classes of soils.

The tests to determine liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range in moisture content within which a soil material is in a plastic condition.

The engineering classifications in table 4 are based on data obtained by mechanical analysis and by tests to determine liquid limits and plastic limits.

Engineering Properties

In table 5 the soil series and land types and the map symbols for each are listed and estimates of properties significant in engineering are given. Also given are estimated classifications according to the AASHO and Unified systems for each important layer. The estimated properties are those of the typical soil. Where test data are available, that information was used in making the estimates. Where tests were not performed, the estimates shown are based on comparisons with the soils that were tested in the Kooskia Area and with similar soils in other counties. More information on the range of properties of the soils can be obtained in other parts of this survey, particularly in the section "Descriptions of the Soils."

Permeability of the soil as it occurs in place was estimated. These estimates give the rate in inches per hour that water moves downward through undisturbed soil. The estimates are based on field observations of texture, structure, and porosity of the soil material.

Available water capacity, given in inches per inch of soil depth, is the capacity of a soil to hold water in a form available to plants. The estimates are based on values checked by Shockley (9).

Reaction gives the intensity of the acidity or alkalinity of the soil, expressed in pH values. A pH notation of 7.0 is neutral. A lower value indicates acidity; a higher value indicates alkalinity.

The shrink-swell potential refers to the change in volume of the soil that results from a change in moisture content. It is estimated on the basis of the amount and type of clay in the soil layers.

Ratings for corrosivity of untreated steel given in table 5 indicate the potential hazard to uncoated steel pipe through chemical action that weakens or destroys the metal.

Engineering Interpretations

Table 6 gives ratings of the suitability of the soils as a source of topsoil and road fill; gives features that affect work on highways and on structures that conserve soil and water; and gives limitations of the soils for use as disposal fields for septic tanks. The interpretations are based partly on estimates and partly on test data and on field experience. Mixed alluvial land, Riverwash, Rock land, and Rock outcrop are not listed in the table. These land types are too variable in characteristics to be rated or otherwise are not suitable for engineering.

The suitability of the soils as a source of topsoil refers to soil material, preferably rich in organic matter that is used as a topdressing for roadbanks, lawns, gardens, and other areas where a good seedbed is needed for establishment of vegetation. Only the surface layer of a soil was rated, unless the subsoil also was considered to have properties making it suitable for use as topsoil.

Features considered in rating the soils for use as road fill are plasticity, wetness, compaction characteristics, hazard of erosion, stones in and on the soil, and depth to bedrock. Texture of the various layers in the soils is given in the section, "Descriptions of the Soils." No commercial sand or gravel pits are in the Kooskia Area. River deposits and outcrops of rock, however, can be crushed and used for construction material.

The location of a highway is influenced by depth to bedrock, by drainage, by the hazards of flooding and frost, and by workability of the soil.

In areas that are flooded occasionally or seasonally or where the water table is high, such as on the bottom lands, the surface of a pavement should be built above flood level.

The workability of the soil, or its suitability for cutting, filling and compacting within a wide range of moisture content, is particularly important in working a soil when wet. Workability depends chiefly upon the amount of fines in a soil and its natural drainage. The ratings used in table 6 for workability are good, fair, and poor. A rating of good means that the soil is sandy or gravelly, contains only a few fines, and can be compacted when wet. The rating fair means that the soil is silty, clayey, or poorly graded sand that contains many fines; or is clay that has low plasticity, and that these soils can be fairly well compacted when wet. A rating of poor means that the soil is silty or clayey, contains many fines, and much highly plastic clay, is poorly or somewhat poorly

TABLE 4.--ENGINEERING TEST

[Tests performed by the U.S. Department of Commerce, Bureau of Public Roads (BPR) in accordance

Soil name and location	Report No.	Depth	Moisture-density 1/		Mechanical analysis 2/			
			Maximum dry density	Optimum moisture	Percentage passing sieve--			
					3-in.	3/4-in.	3/8-in.	No. 4 (4.7 mm.)
		In.	Lb. per cu. ft.	Pct.				
Caribel silt loam:								
SW¼SW¼ sec. 36, T. 34 N.,	S-38539	2-8	---	---	---	---	---	---
R. 4 E.	S-38540	24-41	96	28	---	---	---	---
	S-38541	57-63	---	---	---	---	---	---
Jughandle sandy loam:								
NW¼NE¼ sec. 27, T. 35 N.,	S-38547	5-16	---	---	---	100	99	97
R. 6 E.	S-38548	16-30	---	---	---	---	100	99
	S-38549	30-58	117	12	---	---	100	97
Kooskia silt loam:								
SW¼NE¼ sec. 22, T. 33 N.,	S-38558	0-8	---	---	---	---	---	---
R. 4 E.	S-38559	21-26	---	---	5/ 95	95	95	95
	S-38560	26-37	101	22	100	98	98	98
	S-38561	54-67	---	---	100	95	95	95
Lochsa sandy loam:								
SW¼SW¼ sec. 28, T. 33 N.,	S-38562	0-8	---	---	---	---	100	99
R. 7 E.	S-38563	8-22	114	15	---	---	---	---
	S-38564	38-50	117	13	---	---	100	99
Potlatch silt loam:								
SW¼NE¼ sec. 26, T. 30 N.,	S-38568	1-6	---	---	---	---	---	---
R. 4 E.	S-38569	12-17	---	---	---	---	---	---
	S-38570	27-40	---	---	---	---	---	---
Suttler loam:								
SW¼SE¼ sec. 14 T. 30 N.,	S-38571	0-4	---	---	---	---	---	---
R. 4 E.	S-38572	9-26	115	14	---	---	---	---
	S-38573	40-54	113	14	---	---	---	---

1/ Based on AASHO Designation: T 99-57, Method C (1).

2/ Mechanical analysis according to AASHO Designation: T 88-57 (1). Results by this procedure frequently may differ somewhat from the results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the grain-size fraction. The mechanical analysis data used in this table are not suitable for naming textural classes of soils.

DATA OF REPRESENTATIVE SOILS

with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis 2/--Con.							Liquid limit	Plasticity index	Classification	
Percentage passing sieve--Con.			Percentage smaller than--							
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO	Unified 3/
100	88	78	75	57	29	17	40	10	A-4	ML
100	90	80	77	60	38	30	48	17	A-7-5	ML
100	91	81	79	70	49	39	50	18	A-7-5	ML
92	64	40	37	25	9	4	(4/)	(4/)	A-4	SM
93	62	33	29	20	8	6	(4/)	(4/)	A-2-4	SM
88	54	19	16	10	4	3	(4/)	(4/)	A-2-4	SM
100	98	94	92	70	38	27	42	13	A-7-6	ML
95	92	84	82	59	28	17	27	6	A-4	ML-CL
98	95	89	87	72	51	43	46	23	A-7-6	CL
94	90	85	83	74	55	47	58	29	A-7-6	MH-CH
96	74	34	30	23	14	10	(4/)	(4/)	A-2-4	SM
100	81	36	32	25	15	10	(4/)	(4/)	A-4	SM
96	76	30	25	17	10	7	(4/)	(4/)	A-2-4	SM
100	86	62	58	43	24	16	29	6	A-4	ML-CL
100	85	58	53	40	22	14	27	8	A-4	ML-CL
100	91	70	66	58	40	33	43	19	A-7-6	CL
100	84	52	48	37	18	12	(4/)	(4/)	A-4	ML
100	86	52	47	36	20	13	28	5	A-4	ML-CL
100	85	35	29	17	8	6	(4/)	(4/)	A-2-4	SM

3/ SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a borderline classification. Examples of borderline classifications by this use are MH-CH and ML-CL.

4/ Nonplastic.

5/ 100 percent passing 4-inch sieve.

[Not included in this table, because their characteristics are too variable to be classified,

Soil series and map symbols	Depth to hard bedrock	Depth to seasonal high water table	Depth from surface (typical profile)	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Brody: BcE	1½-3½	5+	0-13	Cobbly silt loam	ML
			13-30	Cobbly and very gravelly silt loam.	GM
			30	Fractured basalt bedrock.	
Caribel: CaA, CaB, CaC, CaC2, CaD.	4+	5+	0-73	Silt loam and silty clay loam.	CL or ML
			73	Weathered basalt bedrock.	
Colville, noncalcareous variant: Co.	5+	2-4	0-50	Loam and clay loam	CL
			50-60	Loamy sand	SM
Greencreek: GcC	4½+	5+	0-14	Loam that is gravelly, cobbly, and stony in places.	ML or CL
			14-58	Clay loam that is gravelly, cobbly, and stony in places.	CL
			58	Quartzite stones or bedrock.	
Gwin: GkE, GmD, GmE, GsE (For properties of Klicker soils in mapping unit GkE, of Mehlhorn soils in units GmD and GmE, and of Sallyann soils in unit GsE, refer to Klicker, Mehlhorn, and Sallyann series, respectively, in this table.)	1-1½	5+	0-18	Stony silt loam	ML
			18	Basalt bedrock.	
Helmer: HeA, HeB, HeC, HeD	4+	5+	0-66	Silty clay loam	ML or CL
Helmer, loamy variant: HmC	5+	5+	0-20	Silt loam	ML
			20-74	Gravelly sandy clay loam	GC or SC
Jacknife: JaB, JaC, JaC2, JaD, JmD, JmD2. (For properties of Mehlhorn soils in mapping units JmD and JmD2, refer to Mehlhorn series in this table.)	5+	5+	0-18	Silt loam	ML
			18-60	Cobbly and gravelly heavy silty clay loam.	CL or CH
Jacknife, loamy variant: JcA, JcB, JcC, JcC2.	5+	5+	0-62	Loam	ML
Jughandle: JuD, JuE	3½-5½	5+	0-30	Sandy loam	SM
			30-68	Gravelly loamy coarse sand-	GM

See footnotes at end of table.

are the land types Mixed alluvial land (Mn), Rock land (Rk), and Rock outcrop (Ro)]

Classification--Con.	Percentage passing sieve--			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity (uncoated steel)
AASHO	No. 4	No. 10	No. 200					
				Inches per hour	Inches per inch of soil	pH value		
A-4	1/ 65-85	60-85	50-75	0.8-2.5	0.11-0.13	5.6-6.5	Low----------	Low.
A-1 or A-2	1/ 20-60	10-50	5-35	0.8-2.5	0.05-0.07	5.6-6.5	Low----------	Low.
A-7 or A-6	100	85-100	65-80	0.2-0.8	0.18-0.20	5.0-6.0	Moderate-----	Moderate.
A-4 or A-6	100	100	60-75	0.2-0.8	0.18-0.20	5.1-7.3	Moderate-----	High.
A-1	90-100	85-95	15-25	10.0+	0.07-0.09	6.6-7.3	Low----------	High.
A-4	1/ 85-95	80-90	50-60	0.8-2.5	0.15-0.17	5.1-5.5	Low----------	Low.
A-6	1/ 85-95	80-90	50-60	0.2-0.8	0.16-0.18	4.0-5.0	Moderate-----	Moderate.
A-4	1/ 55-70	50-65	35-50	0.2-0.8	0.13-0.15	5.6-6.5	Low----------	Low.
A-4 or A-6	100	90-100	75-90	0.05-0.2	0.18-0.20	5.1-6.0	Moderate-----	Moderate.
A-4	95-100	85-95	65-80	0.8-2.5	0.18-0.20	5.1-5.5	Low----------	Low.
A-2 or A-4	70-80	60-70	30-40	0.2-0.8	0.12-0.14	4.6-5.5	Moderate-----	Moderate.
A-4	85-95	80-90	60-75	0.8-2.5	0.18-0.20	5.1-6.5	Low----------	Moderate.
A-7	1/ 60-80	50-70	40-50	0.05-0.2	0.13-0.15	5.1-7.3	Moderate-----	High.
A-4	85-100	85-100	50-65	0.8-2.5	0.17-0.19	5.6-7.3	Low----------	Low.
A-4	90-100	85-95	35-50	2.5-5.0	0.10-0.12	5.6-6.5	Low----------	Low.
A-2 or A-1	1/ 65-75	60-70	5-20	10.0+	0.04-0.06	5.1-6.0	Low----------	Low.

Soil series and map symbols	Depth to hard bedrock	Depth to seasonal high water table	Depth from surface (typical profile)	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Klicker: KcD, KcE	1½-3½	5+	0-19	Silt loam	ML
			19-33	Cobbly and very gravelly silty clay loam.	GC
			33	Decomposed basalt bedrock.	
Kooskia: KoA, KoB, KoB2, KoC, KoC2.	3½+	2-2½	0-30	Heavy silt loam	ML
			30-72	Silty clay that contains basalt fragments in lower part.	CL or CH
			72	Basalt bedrock.	
Lochsa: LoE, LsF, LuE, LyE (For properties of Yakus soils in mapping units LuE and LyE, refer to Yakus series in this table.)	3½+	5+	0-56	Gravelly coarse sandy loam	SM
			56	Moderately decomposed mica schist or gneiss bedrock.	
Mehlhorn: MgD (For properties of Gwin soils in this mapping unit, refer to Gwin series in this table.)	1½-3½	5+	0-28	Gravelly clay loam	SC or GC
			28	Fractured basalt bedrock.	
Molly: MoC, MoE	3½+	5+	0-60	Coarse sandy loam that contains gravel in places.	SM
			60	Partly disintegrated bedrock.	
Nicodemus: NcA, NcB	5+	5+	0-30	Loam and fine sandy loam	SM
			30-60	Stratified cobblestones, gravel, and sand.	GW
Potlatch: PoA, PrC (For properties of Greencreek soil in mapping unit PrC, refer to Greencreek series in this table.)	5+	2-5	0-14	Silt loam and loam	ML or CL
			14-55	Light clay	CL or CH
			55-80	Gravelly sandy clay loam	SC
Riverwash: Re	5+	(2/)	0-60	Variable material that is mostly gravel or gravelly sand.	GW or GP
Sallyann: SaE	1½-3½	5+	0-31	Stony, cobbly, and gravelly loam and clay loam.	GC or SC
			31	Greenstone bedrock.	
Suttler: SuB, SuC, SuE	3½-4½	5+	0-26	Loam	ML or CL
			26-54	Fine sandy loam that is gravelly and channery in places.	SM
			54	Weathered schist bedrock.	

See footnotes at end of table.

PROPERTIES OF THE SOILS--Continued

Classification--Con.	Percentage passing sieve--			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity (uncoated steel)
AASHO	No. 4	No. 10	No. 200					
				Inches per hour	Inches per inch of soil	pH value		
A-4	85-100	80-95	60-75	0.8-2.5	0.18-0.20	5.6-6.5	Low----------	Low.
A-2 or A-4	1/ 25-70	20-50	15-40	0.8-2.5	0.05-0.07	5.6-6.5	Low----------	Low.
A-4 or A-7	100	100	85-95	0.8-2.5	0.18-0.20	5.1-6.0	Moderate-----	Moderate.
A-7	90-100	90-100	75-90	0.05-0.2	0.15-0.17	4.5-7.3	High---------	High.
A-2	80-95	75-90	20-35	2.5-5.0	0.08-0.10	5.1-6.5	Low----------	Low.
A-6	1/ 70-80	60-70	35-45	0.2-0.8	0.12-0.14	5.6-7.3	Low to moderate.	Moderate.
A-4	90-100	85-95	35-45	2.5-5.0	0.10-0.12	4.5-6.5	Low----------	Low.
A-4	85-95	80-90	35-45	2.5-5.0	0.11-0.13	5.1-6.5	Low----------	Low.
A-1	1/ 10-40	5-35	0-5	10.0+	0.03-0.05	6.6-7.3	Low----------	Low.
A-4	95-100	90-100	60-70	0.8-2.5	0.18-0.20	4.5-5.5	Low----------	High.
A-7	95-100	95-100	65-75	0.05-0.2	0.14-0.16	5.1-6.5	High---------	High.
A-4	1/ 65-80	60-80	35-45	0.8-2.5	0.10-0.12	6.1-7.3	Moderate-----	High.
A-1	20-60	10-50	0-5	10.0+	0.03-0.05	5.6-7.3	Low----------	High.
A-6	1/ 65-75	60-70	35-45	0.2-0.8	0.12-0.14	6.1-7.3	Low to moderate.	Moderate.
A-4	90-100	85-100	50-60	0.8-2.5	0.16-0.18	5.1-6.0	Low----------	Low.
A-2	90-100	85-100	25-35	2.5-5.0	0.10-0.12	4.5-6.0	Low----------	Low.

Soil series and map symbols	Depth to hard bedrock	Depth to seasonal high water table	Depth from surface (typical profile)	Classification	
				USDA texture	Unified
	Feet	Feet	Inches		
Weedmark: WeB, WmC, WmC2, WmD---	3½-4½	5+	0-17 17-43 43	Loam and silt loam---------- Clay loam---------- Quartz monzonite bedrock.	ML CL
Yakus: YaD, YaE, YlE---------- (For properties of Lochsa soil in mapping unit YlE, refer to Lochsa series in this table.)	½-1½	5+	0-11 11-16 16	Coarse sandy loam that contains gravel in places. Disintegrated quartz monzonite or quartz diorite bedrock. Bedrock.	SM

1/ The part not passing sieve contains all coarse fragments, including those more than 3 inches in diameter.

PROPERTIES OF THE SOILS--Continued

Classification--Con.	Percentage passing sieve--			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity (uncoated steel)
AASHO	No. 4	No. 10	No. 200					
				Inches per hour	Inches per inch of soil	pH value		
A-4	95-100	90-100	55-65	0.8-2.5	0.16-0.18	5.1-6.0	Low---------	Low.
A-6	95-100	90-100	65-75	0.2-0.8	0.18-0.20	5.1-6.0	Moderate----	Moderate.
A-2	85-95	80-95	25-35	0.8-2.5	0.09-0.11	5.6-6.5	Low---------	Low.

2/ Variable soil material; subject to flooding.

TABLE 6.--ENGINEERING

[Dashes indicate information does

Soil series and map symbols	Suitability as a source of--		Soil features affecting--	
	Topsoil	Road fill	Highway locations	Farm ponds: Reservoir area
Brody: BcE----------	Poor in all layers--	Good----------	Slight to moderate hazard of frost heaving; well drained or somewhat excessively drained; fair to good workability.	Moderate permeability; 20 to 40 inches deep to bedrock that is fractured in places.
Caribel: CaA, CaB, CaC, CaC2, CaD.	Fair in surface layer; poor in other layers.	Poor----------	Severe hazard of frost heaving; well drained; fair workability.	Moderately slow permeability in subsoil.
Colville, noncalcareous variant: Co.	Good in surface layer; poor in other layers.	Poor: Along Lolo Creek the substratum is fair to good for gravel at a depth below 4 feet.	Moderately high water table; severe hazard of frost heaving; somewhat poorly drained; fair workability; flooded occasionally.	Moderately slow permeability.
Greencreek: GcC-----	Fair in surface layer; poor in other layers.	Poor----------	Moderate to severe hazard of frost heaving; well drained; poor to fair workability.	Moderately slow permeability.
Gwin: GkE, GmD, GmE, GsE. (For interpretations of Klicker soils in mapping unit GkE, Mehlhorn soils in mapping units GmD and GmE, and Sallyann soils in mapping unit GsE, refer to Klicker, Mehlhorn, and Sallyann series, respectively, in this table.)	Fair in surface layer; not suitable in other layers.	Poor----------	Shallow to basalt; moderate to severe hazard of frost heaving; well drained or somewhat excessively drained; good to fair workability.	Soil material is 10 to 20 inches deep to fractured bedrock.

not apply or is not available]

Soil features affecting--Con.				Limitations for use as disposal fields for septic tanks
Farm ponds--Con. Embankment	Agriculture drainage	Irrigation	Waterways	
High shear strength; high resistance to piping and medium resistance to cracking.	Not needed----------	----------	Highly erodible-----	Severe: Steep or very steep slopes; bedrock at a depth of 20 to 40 inches.
Medium shear strength; high resistance to piping and cracking.	Not needed----------	----------	Highly erodible on steeper slopes.	Severe: Moderately slow permeability in subsoil.
Medium shear strength; medium resistance to piping and cracking.	Moderately slow permeability; moderately high water table.	High available water capacity; moderate intake rate.	Periodic flooding; deposition in places.	Severe: Water table at a depth of 24 to 48 inches most of year; subject to flooding.
Low shear strength; high resistance to piping and cracking.	Not needed----------	----------	Moderately erodible-	Severe: Moderately slow permeability in subsoil.
Medium shear strength; medium resistance to piping and cracking.	Not needed----------	----------	Not enough soil to allow shaping.	Severe: Hilly to very steep slopes; bedrock at depth of 10 to 20 inches.

Soil series and map symbols	Suitability as a source of--		Soil features affecting--	
	Topsoil	Road fill	Highway locations	Farm ponds: Reservoir area
Helmer: HeA, HeB, HeC, HeD.	Fair in surface layer; poor in other layers.	Poor----------	Moderate to severe hazard of frost heaving; moderately well drained; fair to good workability.	Slow permeability in subsoil.
Helmer, loamy variant: HmC.	Fair in surface layer; poor in other layers.	Good in upper subsoil; fair in lower subsoil.	Moderate to severe hazard of frost heaving; well drained; fair to good workability.	Moderately slow permeability in subsoil.
Jacknife: JaB, JaC, JaC2, JaD, JmD, JmD2. (For interpretations of Mehlhorn soils in mapping units JmD and JmD2, refer to the Mehlhorn series in this table.)	Good in surface layer; poor in other layers.	Fair in surface layer; poor in subsoil.	Moderate to severe hazard of frost heaving; well drained; poor to fair workability.	Slow permeability in subsoil.
Jacknife, loamy variant: JcA, JcB, JcC, JcC2.	Good in surface layer; fair in subsoil; poor in substratum.	Fair----------	Severe hazard of frost heaving; well drained; fair to good workability.	Moderate permeability in subsoil.
Jughandle: JuD, JuE.	Poor in all layers-	Good----------	Slight hazard of frost heaving; somewhat excessively drained; good workability.	Moderately rapid permeability; 40 to 66 inches deep to weathered bedrock.
Klicker: KcD, KcE---	Fair in surface layer; poor in other layers.	Poor----------	Moderate to severe hazard of frost heaving; well drained; poor to good workability.	Moderate permeability; 20 to 40 inches deep to bedrock that is fractured in places.

Soil features affecting--Con.				Limitations for use as disposal fields for septic tanks
Farm ponds--Con. Embankment	Agriculture drainage	Irrigation	Waterways	
Low shear strength; high resistance to piping and cracking.	Slow permeability in subsoil.	----------	Highly erodible-----	Severe: Slow permeability in subsoil.
Medium shear strength; medium resistance to piping and cracking.	Not needed---------	----------	Moderately erodible-	Severe: Moderately slow permeability.
Low to medium shear strength; variable resistance to piping and cracking.	Not needed---------	High available water capacity; slow intake rate.	Highly erodible on steeper slopes.	Severe: Slow permeability.
Medium shear strength; low resistance to piping and cracking.	Not needed---------	High available water capacity; moderate intake rate.	Erodible on steeper slopes.	Slight to moderate on 0 to 5 percent slopes, moderate on 5 to 10 percent slopes, and severe on 10 to 25 percent slopes; moderate permeability.
High shear strength; low resistance to piping and cracking.	Not needed---------	----------	Highly erodible; shaping affected by nearness of bedrock to surface in places.	Severe: Weathered bedrock at depth of 40 to 66 inches; slopes more than 12 percent.
Medium shear strength; low resistance to piping and cracking.	Not needed---------	----------	Highly erodible on steeper slopes; nearness of bedrock to surface limits shaping in some places.	Severe: Bedrock at depth of 20 to 40 inches; slopes generally hilly to very steep.

Soil series and map symbols	Suitability as a source of--		Soil features affecting--	
	Topsoil	Road fill	Highway locations	Farm ponds: Reservoir area
Kooskia: KoA, KoB, KoB2, KoC, KoC2.	Good in surface layer; poor in other layers.	Poor----------	Severe hazard of frost heaving; moderately well drained; fair to poor workability; unsurfaced roads on these soils are soft and impassable in wet weather.	Slow permeability in subsoil.
Lochsa: LoE, LsF, LuE, LyE. (For interpretations of Yakus soils in mapping units LuE and LyE, refer to the Yakus series in this table.)	Poor in all layers--	Poor to fair source of sand and rock fragments to a depth of 40 to 80 inches.	Moderate hazard of frost heaving; somewhat excessively drained; good workability; mostly steep to very steep slopes.	Moderately rapid permeability.
Mehlhorn: MgD-------- (For interpretations of Gwin soils in this mapping unit, refer to the Gwin series in this table.)	Fair in surface layer; poor in other layers.	Poor----------	Moderate hazard of frost heaving; well drained or somewhat excessively drained; fair to good workability.	Moderately slow permeability; 20 to 40 inches deep to fractured bedrock.
Molly: MoC, MoE------	Fair in surface layer; poor in other layers.	Good----------	Moderate hazard of frost heaving; well drained or somewhat excessively drained; fair to good workability.	Moderately rapid permeability; 40 to 70 inches deep to weathered bedrock.
Nicodemus: NcA, NcB--	Good in surface layer; fair in subsoil; poor in substratum.	Good: Soils near Kooskia have substratum of sand and gravel at depth of 24 to 40 inches.	Slight hazard of frost heaving; well drained; fair to good workability; flooded occasionally.	Moderately rapid permeability.
Potlatch: PoA, PrC-- (For interpretations of Greencreek soils in mapping unit PrC, refer to Greencreek series in this table.)	Fair in surface layer; poor in other layers.	Poor----------	Severe hazard of frost heaving; somewhat poorly drained; poor to fair workability.	Slow permeability in subsoil.

Soil features affecting--Con.				Limitations for use as disposal fields for septic tanks
Farm ponds--Con. Embankment	Agriculture drainage	Irrigation	Waterways	
Medium shear strength; low resistance to piping and cracking.	Slow permeability in subsoil.	----------	Highly erodible on steeper slopes.	Severe: Bedrock at depth of 3½ to 7 feet.
High shear strength; low resistance to piping and cracking.	Not needed----------	----------	Highly erodible-----	Severe: Steep to very steep slopes.
Medium shear strength; medium resistance to piping and cracking.	Not needed----------	----------	Highly erodible----	Severe: Hilly to very steep slopes; bedrock at 20 to 40 inches.
Medium shear strength; low resistance to piping and cracking.	Not needed----------	----------	Highly erodible on steeper slopes.	Severe: Bedrock at depth of 40 to 70 inches; moderately steep to very steep slopes.
Medium shear strength; low resistance to piping and cracking.	Not needed----------	Moderate available water capacity; moderate intake rate.	Gravel or sand at depth of 24 to 40 inches.	Slight on 0 to 7 percent slopes and moderate on 7 to 12 percent slopes; occasional flooding.
Low shear strength; high resistance to piping and cracking.	Slow permeability in subsoil; seasonal high water table at a depth of 24 to 60 inches.	----------	Moderately erodible on steeper slopes.	Severe: Slow permeability below a depth of 14 inches.

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Soil series and map symbols	Suitability as a source of--		Soil features affecting--	
	Topsoil	Road fill	Highway locations	Farm ponds: Reservoir area
Sallyann: SaE----------	Fair in surface layer; poor in other layers.	Poor----------	Moderate to severe hazard of frost heaving; well drained or somewhat excessively drained; fair to good workability.	Moderately slow permeability in subsoil; 20 to 40 inches deep to fractured bedrock.
Suttler: SuB, SuC, SuE.	Fair in surface layer; poor in other layers.	Fair----------	Severe hazard of frost heaving; well drained; fair workability. Most soils have problems of subgrade, cutbank, and fillslope stability.	Moderate permeability; 40 to 50 inches deep to bedrock.
Weedmark: WeB, WmC, WmC2, WmD.	Fair in surface layer; poor in other layers.	Good----------	Moderate to severe hazard of frost heaving; well drained; fair to good workability.	Moderately slow permeability; 40 to 55 inches deep to weathered bedrock.
Yakus: YaD, YaE, YlE-- (For interpretations of Lochsa soils in mapping unit YlE refer to the Lochsa series in this table.)	Poor in all layers.	Good----------	Slight hazard of frost heaving; well drained; fair to good workability; moderately steep to very steep slopes.	Moderate permeability; 9 to 20 inches deep to bedrock.

Soil features affecting--Con.				Limitations for use as disposal fields for septic tanks
Farm ponds--Con. Embankment	Agriculture drainage	Irrigation	Waterways	
Medium shear strength; low resistance to piping and cracking.	Not needed---------	----------	Highly erodible-----	Severe: Steep and very steep slopes; bedrock at depth of 20 to 40 inches.
Medium shear strength; low resistance to piping and cracking.	Not needed---------	----------	Highly erodible on steeper slopes.	Severe on rolling to very steep slopes; in most places bedrock at depth of 40 to 60 inches.
Medium shear strength; low resistance to piping and cracking.	Not needed--------	----------	Erodible; bedrock limits depth of shaping in some places.	Severe: Bedrock at depth of 40 to 55 inches.
High shear strength; medium resistance to piping and cracking.	Not needed---------	----------	Highly erodible; shaping limited by bedrock.	Severe: Bedrock at depth of 9 to 20 inches.

drained in places, and is poorly suited to compaction when wet.

Some features that affect the suitability of the soils for farm ponds are depth to bedrock, permeability, and shear strength. Other factors considered are kind of underlying material and resistance to piping and cracking.

Factors that affect the suitability of the soils for agricultural drainage are also given in table 6. The main factors considered are permeability and presence of a water table.

The chief factors considered in rating the soils as to their suitability for irrigation are the available water capacity and the rate at which water moves into a soil.

Also considered in the table are features that affect the layout and construction of waterways, the establishment and continued growth of vegetation in the waterways, and the maintenance of the waterways. Some of the factors affecting use of the soils for this purpose are the hazards of erosion, flooding, and deposition; steep slopes; and nearness of bedrock to the surface.

Limitations of the soils for disposing of effluent from septic tanks indicate the ability of the soil material to absorb and dispose of effluent without contaminating the surrounding areas. A rating of slight means that the soil has no limitations or that it has slight limitations that are easily overcome. A rating of moderate means that the soil has limitations that can be overcome by good management and manipulation of the soil material. A rating of severe means that suitability for use is questionable and that the limitations are difficult to overcome.

In general, where the slopes are steeper than 10 percent, filter fields are difficult to lay out and construct and seepage beds are impractical (5). Areas that have slopes of more than 10 percent can be used as filter fields for septic tanks, however, if the soil is deep and well drained and is underlain by a deep, friable substratum. In some places, however, pollution downslope is likely, and the cost of excavating and grading generally is high.

The soil map at the back of this soil survey is reliable for predicting the general suitability of an area of several acres, but it may not contain sufficient detail to predict the suitability for a specific site. Soil variations may occur within a short distance, and most maps are not detailed enough to supply the precise information as to where on a building site a filter field should be located. Therefore, onsite evaluation by a soil scientist or measurements of the rate of water movement by an engineer may be needed. The rate of water movement is measured by a percolation test. A percolation test will not only indicate whether the soil is suitable but will also provide the information needed to calculate the size of the filter field.

Hydrologic groups.--Engineers and soil scientists of the Soil Conservation Service have classified the major soil series into four hydrologic groups. The grouping is based on data and estimates of the intake of water during the latter part of a storm of long duration, after the soil profile is wet and has an opportunity to swell, without the protective effect of any vegetation. The grouping is tentative and subject to change as further data and experience are gained. The four groups and the soil series in each are:

A. Soils that have a high infiltration rate, even when thoroughly wetted. They are mostly deep, well-drained to somewhat excessively drained and consist of sand or gravel or of sand and gravel combined. These soils have a high rate of water transmission and a low runoff potential. No soils in the Kooskia Area are in group A.

B. Soils that have a moderate infiltration rate when thoroughly wetted. They are moderately well drained and well drained, are moderately fine textured to moderately coarse textured, and are mostly moderately deep and deep. These soils have a moderate rate of water transmission. The soil series in group B in the Kooskia Area are Caribel, Jughandle, Klicker, Lochsa, Molly, Nicodemus, Suttler, and Weedmark. The Jacknife, loamy variants, are also in this group.

C. Soils that have a slow rate of infiltration when thoroughly wetted. They contain a layer that impedes the downward movement of water, or are moderately fine textured to fine textured. These soils have a slow rate of water transmission. The soil series in group C in the Kooskia Area are Greencreek, Helmer, Jacknife, Kooskia, Mehlhorn, and Sallyann. The Helmer, loamy variants, are also in this group.

D. Soils that have a very slow rate of infiltration when thoroughly wetted. They are mainly (1) clay soils that have high shrink-swell potential, (2) soils that have a permanent high water table, (3) soils that have a claypan or clay layer at or near the surface, and (4) soils that are shallow to nearly impervious material. These soils have a very slow rate of water transmission and high runoff potential. The soil series in group D in the Kooskia Area are Brody, Gwin, Potlatch, and Yakus. The Colville, noncalcareous variants, are also placed in this group, mainly because of a high water table. If the high water table is lacking, these variants are placed in group B.

In this section the factors that have affected the formation of the soils in the Kooskia Area are discussed. Then the current system of soil classification is explained and the soil series are placed in higher categories. The soil series in the Area, including a profile representative of each series, are described in the section "Descriptions of the Soils."

Factors of Soil Formation

Soil is formed by weathering and other processes that act upon parent material. The characteristics of the soil at any given point depend on the parent material from which the soil formed, the climate under which the soil material has existed, the plant and animal life in and on the soil, the relief, or lay of the land, and the length of time the factors of soil formation have acted on the soil material.

Climate and plants and animals are the active forces of soil formation. They act on the parent material accumulated through the weathering of rocks and slowly change it into soil. All five factors come into play in the formation of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of a soil and fix most of its properties. In general, however, it is the combined action of the five factors that determines the present character of each soil.

Soil-forming factors generally are complex. Each interacts with the other and slowly, but constantly, changes are brought about. The soil itself is complex. It is constantly changing and never reaches a static condition. At any stage in the history of a soil, the surface layer may be wholly or partly removed by erosion and the material beneath exposed. The soil-forming factors then begin working on a new surface layer.

Parent material.--The soils of the Kooskia Area are forming in materials weathered from a variety of rocks and in materials transported by wind, water, and gravity.

About two-thirds of the survey area, and nearly all of the eastern and southern parts, are underlain by the Idaho batholith and related rocks (2). According to the Geologic Map of Idaho County, published by Idaho Bureau of Mines and Geology, the batholith in Cretaceous time intruded the sedimentary and metamorphic rocks of the Belt Series, which are of Precambrian age, and the metamorphic and volcanic rocks of the Seven Devils formation, which are of the Permian and Triassic periods.

In the northeastern and northwestern parts of the survey area, mainly quartz monzonite and granite of the central core of the batholith are exposed, but quartz diorite is present in places. From Eldorado Creek southward in the eastern part of the Area, and in most of the southern part, gneiss, schist, and related gneissic rocks that surround parts of the Idaho batholith predominate. These may include gneiss and schist formed by recrystallization of rocks of the Belt series. These rocks are coarsely banded and contain much feldspar. Examples of soils that formed in regolith from these rocks are those of the Jughandle, Lochsa, Suttler, and Yakus series.

Most soils in the western part of the survey area, southward to about Harpster, are underlain by Columbia River basalt. Soils formed mostly in residuum from basalt are those of the Caribel, Gwin, and Mehlhorn series.

South of Harpster, a small tract in the southwestern corner of the survey area is underlain by Seven Devils metamorphosed volcanic rocks. These rocks resemble greenstone in most places. They consist of greatly altered lava flows, mainly of andesitic composition, and of intrusive dikes and stocks of dioritic and gabbroic composition. The Sallyann soils formed in material weathered from greenstone.

In much of the survey area, the soils have been influenced by a fairly thin deposit of wind-laid silt and very fine sand (loess). This silt material came mostly from the basin of the Columbia River. The broader ridges in the northwestern part of the survey area have 2 to 4 feet of this material on them. The layer of silty material is thinnest toward the east and south and on slopes where erosion has removed some of the material. In these areas the influence of the silty material on the soils is minor. On many of the steep slopes silt has had little or no influence on the soils that formed.

The silt probably was deposited during two or three stages, or it may have been laid down over a long period. If the Bt horizon of soils in the Kooskia series, for example, is derived from wind-laid silt, the material may have been deposited in the Yarmouth or pre-Illinoian stage. Most of the silt, however, was probably deposited during the Sangamon or pre-Iowan stage. Deposits since then seem to have been minor, and they probably have had little or no influence on most of the soils. The Helmer soils, and probably most of the Kooskia soils, formed in silty material. The Molly and Weedmark soils formed in a thin mantle of silt laid down on material weathered from granite and related rocks.

Some volcanic ash or dust may have settled on the survey area during the eruption of Mount Mazama in prehistoric times. Its influence on most of the soils, however, is minor. Soils of the Brody, Helmer, and Molly series may have a slight content of volcanic ash.

The alluvium laid down along the larger streams, such as the Clearwater River, is derived mainly from granite, gneiss, schist, and related rock sources. Formed in such alluvium are soils of the Colville, Greencreek, Nicodemus, and Potlatch series. The Jacknife soils formed in local alluvium and colluvium that is dominantly of basaltic

origin but possibly was influenced by wind-laid silt.

Climate.--Temperature and moisture are probably the most important factors that determine the rate at which minerals are weathered and translocated within a soil. They also determine, to a great extent, the amount and kind of vegetation that grows on the soils and the rate at which the vegetation decomposes.

The annual precipitation in the survey area ranges from about 21 inches near Kamiah to more than 40 inches near the peak of Pine Knob. The average snowfall is about 2 feet. At high altitudes much of the precipitation falls as snow, and snow depths of 10 feet are common in the mountains.

In general the greater the precipitation the more strongly leached are the soils. Precipitation is sufficient throughout the Area to completely remove calcium carbonate (lime) and the more soluble materials from the soil. This leaching is reflected not only in the removal of lime, but in the base saturation. For example, the Jughandle and Molly soils, which receive about 30 to 42 inches of rain per year, have a lower base saturation than Kooskia and Sallyann soils, which receive about 24 to 28 inches of precipitation per year.

The combined effects of temperature and precipitation are favorable for the formation of clay. Some of the soils, such as those of the Jacknife series, for example, have a strongly developed clayey Bt horizon.

Plants and animals.--Plants, micro-organisms, earthworms, and other forms of life that live on and in the soil are active in the soil-forming processes. The changes they bring about depend mainly on the life processes peculiar to each. Generally the kind of soil in an area varies according to the type of vegetation.

In the Kooskia Area the soils formed under two general types of vegetation--grasses and coniferous trees. The soils that formed mostly under grasses have a dark surface layer. They are medium acid to neutral in reaction. Examples are soils of the Gwin, Jacknife, Mehlhorn, and Yakus series and the loamy variants from the Jacknife series. The soils that formed under woodland dominantly of conifers are light to somewhat dark in color. They are medium acid to strongly acid, and they are more strongly leached than the soils that formed under grasses. Soils in wooded areas are those of the Brody, Caribel, Helmer, Jughandle, Klicker, Kooskia, Lochsa, Sallyann, Weedmark, and Suttler series. Also formed in wooded areas are the loamy variants from the Helmer series.

Relief.--Relief, through its effect on drainage, aeration, runoff, and erosion, is an important factor in the formation of soils. Differences in relief may produce a microclimatic effect by radically influencing moisture and air conditions within the soil. This effect produces one kind of soil on the slopes that face south and another kind on the slopes that face north. The Gwin soils, for example, formed on south-facing slopes, and the Klicker soils on north-facing slopes in the same area and formed in similar material. Soils, such as those of the Lochsa series, formed on steep slopes generally do not have a strongly developed profile. This is because of the reduced percolation of water through the soil material and the lack of enough water for vigorous growth of plants. Soils such as the Kooskia, for example, that have a strongly developed profile are on gentler slopes, and water is removed slowly from the soil material.

Time.--Time is required by the active agents of soil formation to form soils from parent material. A soil that has not been in place long enough for the processes of soil formation to produce a soil having distinct horizons is considered young, or recent. A soil that has developed certain definite characteristics, however, is said to be old, or mature. Thus, the thickness and characteristics of a soil depend upon the length of time that the various processes have acted, the intensity of the processes, and the resistance of the parent material to change.

Horizon differentiation and degree of profile development in a soil depend on the length of time the material has been subjected to weathering. Recent deposits of parent material show little change, but older deposits reveal increasing horizon differentiation. Several factors, however, influence the time required for a soil to form. Less time is required, for example, for a distinct profile to form in a warm humid climate than in a cold or dry region. Also soil forms more slowly in areas of little rainfall than in areas where rainfall is ample and vegetation is plentiful. In the Kooskia Area, Nicodemus soils are examples of young soils, and Kooskia soils are examples of mature soils.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (4) and later revised (11). The system currently used was adopted for general use by the National Cooperative Soil Survey

in 1965 (14). The current system is under continual study. Therefore, readers interested in developments of this system should search the latest literature available (10). The soil series of the Kooskia Area are placed in some categories of the current system in table 7. The classes in the current system are briefly defined in the paragraphs that follow.

ORDERS: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. The exceptions, Entisols and Histosols, occur in many different climates. Four soil orders are represented in the Kooskia Area--Alfisols, Inceptisols, Mollisols, and Spodosols.

Alfisols are soils containing a clay-enriched B horizon that has a medium or high base saturation.

Inceptisols generally form on young, but not recent, land surfaces. These soils have weakly developed or incipient horizons.

Mollisols have formed mostly under grass. They have a thick, friable, dark-colored surface layer. Base saturation is more than 50 percent.

Spodosols are soils that have an accumulation of amorphous material in the subsurface horizons.

SUBORDERS: Each order is subdivided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders have a narrower climatic range than the orders. The criteria for suborders chiefly reflect the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUPS: Each suborder is divided into great groups according to the presence or absence of genetic horizons and the arrangement of these horizons.

SUBGROUPS: Each great group is subdivided into subgroups. One of these subgroups represents the central (typic) segment of the great group, and the others, called intergrades, contain those soils having properties of soils in another great group, suborder, or order.

FAMILIES: Each subgroup is divided into families, primarily on the basis of properties important to the growth of plants. Among the properties considered are texture, mineralogy, reaction, and soil temperature.

TABLE 7.--SOIL SERIES CLASSIFIED ACCORDING TO THE CURRENT SYSTEM OF CLASSIFICATION

Series	Family	Subgroup	Order
Brody	Loamy-skeletal, mixed	Typic Cryorthods	Spodosols.
Caribel	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Colville, noncalcareous variant.	Fine-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols.
Greencreek	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Gwin	Loamy-skeletal, mixed, mesic	Lithic Argixerolls	Mollisols.
Helmer	Coarse-silty, mixed	Alfic Cryic Fragiorthods.	Spodosols.
Helmer, loamy variant	Fine-loamy, mixed	Boralfic Cryorthods	Spodosols.
Jacknife	Fine, montmorillonitic, mesic	Pachic Argixerolls	Mollisols.
Jacknife, loamy variant	Fine-loamy, mixed, mesic	Pachic Argixerolls	Mollisols.
Jughandle	Coarse-loamy, mixed	Typic Cryumbrepts	Inceptisols.
Klicker	Loamy-skeletal, mixed, frigid	Ultic Argixerolls	Mollisols.
Kooskia	Fine, montmorillonitic, mesic	Boralfic Argixerolls	Mollisols.
Lochsa	Coarse-loamy, mixed, mesic	Ultic Haploxerolls	Mollisols.
Mehlhorn	Fine-loamy, mixed, mesic	Typic Argixerolls	Mollisols.
Molly	Coarse-loamy, mixed	Typic Cryorthods	Spodosols.
Nicodemus	Loamy-skeletal, mixed, mesic	Cumulic Ultic Haploxerolls	Mollisols.
Potlatch	Fine, montmorillonitic	Aquic Glossoboralfs	Alfisols.
Sallyann	Loamy-skeletal, mixed, mesic	Ultic Argixerolls	Mollisols.
Suttler	Coarse-loamy, mixed	Pachic Cryumbrepts	Mollisols.
Weedmark	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Yakus	Loamy, mixed, mesic	Lithic Haploxerolls	Mollisols.

TABLE 8.--PHYSICAL AND CHEMICAL

[Analyses were made by Department of Agricultural Chemistry and Department of Agronomy, University

Soil name, sample number, location, and horizon	Depth	Particle-size distribution							Bulk density
		Very coarse sand (2 to 1 mm.)	Coarse sand (1.0 to 0.05 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	
	Inches	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Gms./cc.
Brody cobbly silt loam:									
60-Ida-25-7; NE¼SW¼ sec. 7, T. 34 N., R. 6 E.									
B21ir-------	0-3	2.7	4.5	3.1	4.7	5.9	66.0	13.1	----
B22ir-------	3-13	3.4	2.9	2.0	4.2	6.8	67.0	13.7	----
B3ir--------	13-30	6.9	5.3	3.5	6.7	7.9	52.6	17.3	----
Caribel silt loam:									
60-Ida-25-33; SW¼SW¼ sec. 36, T. 34 N., R. 4 E.									
A11---------	0-2	---	---	---	---	---	----	----	----
A12---------	2-8	---	---	---	---	---	----	----	----
B1t---------	8-13	---	---	---	---	---	----	----	----
B21t--------	13-24	---	---	---	---	---	----	----	----
B22t--------	24-41	---	---	---	---	---	----	----	----
B23t--------	41-57	---	---	---	---	---	----	----	----
B3t---------	57-73	---	---	---	---	---	----	----	----
Jughandle sandy loam:									
60-Ida-25-10; NW¼NE¼ sec. 27, T. 35 N., R. 6 E.									
B21ir-------	0-5	8.6	15.8	10.8	12.5	7.4	38.5	6.4	1.3
B22ir-------	5-16	6.3	15.7	12.1	13.2	8.5	32.0	12.2	1.1
C1----------	16-30	10.2	15.3	14.5	20.4	10.8	23.8	5.5	1.6
C2----------	30-58	8.9	21.4	20.9	24.8	10.2	10.6	3.1	1.7
C3----------	58-68	10.1	25.6	20.0	21.3	9.2	12.2	1.8	1.7
Kooskia silt loam[2/]:									
60-Ida-25-34; SW¼NE¼ sec. 22, T. 33 N., R. 4 E.									
A1----------	0-4	.5	.8	.7	2.2	5.6	61.4	28.7	----
A3----------	4-9	.3	.9	.8	1.9	6.0	62.1	28.1	----
B1----------	9-16	.1	.9	.9	2.0	5.9	62.0	28.3	----
B2----------	16-22	.4	1.0	.9	2.2	6.0	61.4	28.1	----
A'&B--------	22-27	.5	1.3	.9	2.3	7.1	69.5	18.4	----
A'2---------	27-30	.8	1.2	1.3	2.4	6.6	69.4	18.2	----
B'&A'-------	30-34	1.0	1.4	1.4	2.6	6.5	54.5	32.7	----
B'21t-------	34-45	0.0	.4	.4	1.0	3.4	43.6	51.2	----
B'22t-------	45-53	---	---	---	---	---	----	----	----
IIB'23t-----	53-65	.2	1.4	1.0	2.3	6.2	56.0	33.0	----
IIB'3t------	65-72	.2	.6	.8	2.0	4.9	37.7	53.8	----

See footnotes at end of table.

CHARACTERISTICS OF SELECTED SOILS

of Idaho. Lack of information indicates information is not available or does not apply]

Reaction (paste)	Organic matter	Total nitrogen	Carbon-nitrogen ratio	Cation exchange capacity (NH_4OAc)	Extractable cations (milliequivalents per 100 grams of soil)					Base saturation (sum)
					Calcium	Magnesium	Sodium	Potassium	Hydrogen	
pH	Percent	Percent		Meq./100 gms.						Percent
5.9	3.24	0.109	17.3	25.1	12.9	0.6	0.1	0.7	14.8	62
6.2	1.67	.070	13.8	22.1	9.7	.6	---	.8	11.8	--
6.1	.70	.010	11.2	1.7	1.0	5.4	(1/)	----	.5	92
5.7	4.33	.171	14.7	27.2	8.2	1.8	.1	1.0	18.5	37
5.6	2.02	.100	11.8	20.3	5.9	1.4	.2	.7	14.9	35
5.6	1.31	.059	12.9	15.9	8.3	1.2	.1	.6	10.2	50
5.8	.52	.045	6.8	22.4	6.7	1.0	.1	.5	10.2	45
5.6	.38	.034	6.4	17.5	4.9	1.5	.1	.5	10.2	43
5.4	.37	.030	7.2	16.0	4.8	2.0	.1	.5	10.2	42
5.0	.37	.025	8.6	17.9	4.2	1.2	.1	.4	10.8	35
5.8	4.05	.138	17.1	15.7	6.1	.6	.1	.7	13.7	35
6.1	1.80	.072	14.5	11.5	3.7	.7	.1	.5	10.8	32
5.8	.30	.017	10.1	5.9	3.7	.9	.1	.3	3.6	58
5.6	.19	.024	4.5	4.1	2.1	.7	.1	.3	3.0	51
5.4	.18	-----	----	4.8	3.7	.6	.1	.3	3.0	61
6.0	6.85	.316	12.6	33.7	17.2	3.4	.1	2.1	13.2	63
6.0	3.72	.183	11.8	22.7	12.6	2.4	.1	1.3	10.2	62
6.1	2.17	.126	10.0	20.2	10.1	2.8	.1	1.2	9.6	60
5.9	1.65	.092	10.5	18.5	11.7	2.9	.2	1.0	7.2	69
6.0	.69	.055	7.3	13.4	8.2	1.5	.2	.5	6.0	64
5.7	.34	.042	4.6	13.8	9.7	2.6	.3	.4	6.0	68
5.0	.55	.052	6.1	20.8	9.3	3.6	.5	.5	9.0	61
4.7	1.00	.062	9.0	31.4	15.9	6.0	.8	.6	9.6	71
5.4	.50	.047	5.7	30.9	18.7	7.8	1.0	.6	7.8	78
6.4	.33	.035	5.4	36.6	18.3	7.4	1.0	.5	6.0	82
6.7	.34	.026	7.5	45.3	30.1	---	1.5	.8	6.0	--

Soil name, sample number, location and horizon	Depth	Particle-size distribution							Bulk density
		Very coarse sand (2 to 1 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)	Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	
	Inches	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Gms./cc.
Molly loam:									
60-Ida-25-9; NE¼NE¼NE¼ sec. 5, T. 34 N., R. 6 E.									
B21ir------	0-3	12.7	8.4	4.8	7.9	8.0	48.4	9.9	0.8
B22ir------	3-14	9.8	8.6	4.5	8.5	10.4	51.1	7.2	.7
IIC1-------	14-17	20.3	13.8	8.1	12.5	9.3	30.9	5.2	1.4
IIC2-------	17-27	14.2	16.0	8.7	14.8	12.3	29.2	4.9	1.6
IIC3-------	27-40	5.4	15.2	9.9	18.4	14.0	30.8	6.3	1.4
IIC4-------	40-60	5.9	19.1	9.3	16.5	9.4	32.6	7.1	1.5
Sallyann stony loam:									
60-Ida-25-20; SE¼SE¼ sec. 18, T. 30 N., R. 4 E.									
A11--------	0-4	13.1	7.7	3.4	4.9	5.4	45.1	20.5	---
A12--------	4-9	5.9	10.2	6.0	5.3	4.9	47.1	20.6	---
B1---------	9-14	8.2	8.5	3.9	5.7	6.9	45.5	21.4	---
B21t-------	14-22	11.1	8.6	3.5	4.7	6.7	43.3	22.1	---
B22t-------	22-31	6.6	10.1	5.0	5.2	4.6	39.5	29.1	---

1/ Trace.

OF SELECTED SOILS--Continued

Reaction (paste)	Organic-matter content	Total nitrogen	Carbon-nitrogen ratio	Cation exchange capacity (NH_4OAc)	Extractable cations (milliequivalents per 100 grams of soil)					Base saturation (sum)
					Calcium	Magnesium	Sodium	Potassium	Hydrogen	
pH	Percent	Percent		Meq./100 gms.						Percent
6.2	3.89	.142	15.9	20.9	8.6	0.5	0.1	0.6	14.3	41
6.4	2.39	.096	14.5	17.7	6.0	.5	.1	.5	8.8	45
6.1	.32	.017	10.8	5.5	4.0	.7	.1	.2	2.7	65
6.0	.21	.013	9.5	4.9	4.1	.4	.1	.1	1.8	73
5.1	.20	.011	10.4	4.5	3.4	.5	.1	.2	2.4	63
4.7	.17	.010	10.1	5.5	2.3	.8	.1	.2	4.8	41
6.2	7.84	.276	16.5	26.6	18.5	4.4	.1	1.4	8.3	75
6.4	5.71	.194	17.1	25.3	17.9	4.4	.1	1.0	6.0	80
6.6	3.63	.149	14.2	24.6	18.1	4.7	.1	.8	4.8	84
6.8	.89	.038	13.4	13.6	9.3	3.3	.1	.3	3.7	78
6.6	.18	.008	13.1	4.9	3.2	1.4	(1/)	.1	1.0	83

2/ Particle-size distribution data obtained by dispersing with sodium carbonate.

SERIES: The series consists of a group of soils that formed from a particular kind of parent material and having genetic horizons that, except for texture of the surface soils, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, consistence, reaction, and mineralogical and chemical composition.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concept at the State, regional, and national levels of responsibility for soil classification results in a judgment that the new series should be established. Most of the soil series described in this publication have been established earlier.

Laboratory Analyses

Table 8 lists the physical and chemical characteristics of seven selected soils of the Kooskia Area. The Analyses were made by the Department of Agricultural Chemistry and the Department of Agronomy, University of Idaho. The profiles of the soils are described in detail in the section "Description of the Soils."

The chemical and physical data in table 8 are helpful in classifying the soils and in making interpretations of their behavior. All laboratory determinations except bulk density were obtained from soil material less than 2 millimeters in diameter. All material was ovendried.

Particle-size distribution analyses were made by pipette and sieve separations. Dispersing agents were used, and mechanical shaking was applied.

Bulk density, expressed in grams per cubic centimeter, was determined from paraffin-coated clods. The clods were dried, then lightly coated with paraffin and weighed in water and air.

Reaction, expressed in pH, was determined from saturated paste by glass electrode. Organic carbon content was obtained by a modified application of Walkley's rapid method (13). The percentage of organic matter was then derived by multiplying the organic carbon value by the factor 1.724. The total nitrogen percentage was determined by the Kjeldahl method (3).

Standard laboratory procedures were used to analyze the soil for cation-exchange capacity and extractable cations. Cation-exchange capacity was determined by the displacement and direct distillation of adsorbed ammonia. Extractable calcium, magnesium, potassium, and sodium were determined by extraction with neutral normal ammonium acetate. Calcium was precipitated as a phosphate and determined colorimetrically with molybdate and vanadate. Analyses for extractable sodium and potassium were made by the use of a Perkin-Elmer flame photometer. Extractable acidity or exchangeable hydrogen was displaced with barium chloride-triethanolamine at pH 8.2.

Base saturation, expressed in percent, was calculated from the sum of extractable cations.

The development of the Kooskia Area is connected with what has been known for many years as the "Lolo Trail." Lewis and Clark traveled over this trail on their way to and from the Pacific Ocean in 1805 and 1806. Somewhat later John Work of Hudson's Bay Company traveled eastward over the trail with a party of trappers and Indians. In 1854 Captain Mullan, seeking a pass for a transcontinental railroad, crossed the Bitterroot Range of the Rocky Mountains by way of the Lolo Trail. In the summer of 1877, after the battle on Battle Ridge, Chief Joseph and his Nez Perce Indians retreated from the Area across the Lolo Trail.

Discovery of gold at Pierce in 1860 and at Elk City and Florence in 1861 brought many miners to the Kooskia Area (6). The town of Stuart, at the junction of the South Fork Clearwater River and the Middle Fork Clearwater River, was established in 1895. Its name was changed to Kooskia in 1898. Stites, a town just south of Kooskia, was settled about 1895.

The railroad along the South Fork Clearwater River was completed as far as Stites in 1899. Logs and freight are still hauled down the river to Lewiston by the Camas Prairie Railroad. Two main highways serve the Area. One is the newly completed Lewis and Clark Highway, between Lewiston and Montana. The other is State Highway 14, which follows the South Fork Clearwater River from Kooskia to Elk City. The Lewis and Clark Highway opens up a great scenic primitive area to tourists.

Timber products remain the major source of income in the survey area. A water-powered sawmill was built at Kooskia as early as 1897, and not long afterwards a sawmill was opened at the community of Caribel. Sawed lumber was flumed from Caribel to the river near Kamiah, a distance of about 10 miles. Sawmills are still important to the Area.

Possibilities for future industry for the survey area include a mica mine 4 miles northeast of Kamiah; clay deposits near Glenwood; and an asbestos mine southeast of Glenwood.

The packing of hunters and fishermen into the back country began in the survey area in 1938. This source of income still is important to the Area.

Farming

The demands of the large mining camps were largely responsible for the early development of farming in the survey area. Men who became disappointed with mining turned to ranching, and the livestock industry was established. Pioneers in the industry were John M. Crooks and Aurora Shumway. They drove a thousand head of cattle from Dalles City, Oregon, to the Kooskia Area in 1864. These cattle were grazed in the mountains and on the Big Camas Prairie west of the survey area in summer and in the deep canyons in winter (6).

Scattered ponderosa pine trees grew on Battle Ridge when the first settlers arrived, but further to the east all the land was forested. The settlers cleared the trees from Battle Ridge before cultivating the soils. Any land needed for cultivation in the forested areas had to be completely cleared before crops could be grown.

Blue barley was the main crop in the survey area between 1870 and 1900. It was used mainly as hay and feed for cattle and hogs. Surplus animals were driven overland to be marketed at Uniontown, Wash.

Some of the principal ridges in the survey area were homesteaded around the year 1900. The Nez Perce Reservation was opened for homesteading in 1895, and all previously unallotted land was under cultivation by 1905.

Goatweed from England that had been packed in with crockery became a pest in the survey area in the late 1890's. After 1900 summer fallow was introduced in the cropping systems as a way of controlling weeds. Controlling the weeds helped to increase the production of barley. Wheat, however, replaced barley as the leading crop after the railroad came to the Area.

Until 1935 the main farm crops were wheat and timothy hay, oats, and barley grown as feed for cattle, hogs, and horses. Most of the grain was fed to the hogs. The excess hay, barley, and oats were sold to the Elk City Stage Line that ran from Stites, Clearwater, and Newsome Creek to Elk City.

Between 1935 and 1946 the main crops were wheat and alsike clover seeds. The plants were grown in 2-year rotation. Because of disease and insects, the growing of alsike clover has gradually decreased. Gypsum was first used on alsike clover in 1942. Ammonium nitrate was used as a fertilizer on wheat in 1952.

General farming, the raising of livestock, and the growing of wheat are the major farm enterprises. Many farmers work part of the year in logging industries. Some livestock are grazed in adjacent forest lands. The main crops are wheat, oats, barley, dry peas, clover, and alfalfa.

About 318 farms are presently in the survey area. The average size of the farms is about 508 acres. The average acreage of cropland per farm is 140. About 5,500 head of livestock graze in the survey area.

Climate[8]

The Kooskia survey area has a modified continental, moist subhumid to humid, microthermal climate. Because of marked differences in the altitude, however, precipitation varies markedly from place to place. Temperature and precipitation data for the town of Kooskia, which has an elevation of 1,261 feet, are given in table 9.

[8] By J. D. Stevlingson, State climatologist for Idaho, ESSA, U.S. Department of Commerce.

TABLE 9.--TEMPERATURE AND PRECIPITATION AT KOOSKIA, IDAHO COUNTY, IDAHO

[Average daily maximum and minimum based on a 50-year record; all other data except for depth of snow based on records from 1931 to 1960; data on depth of snow based on records from 1909 to 1948 that average 16 years for the months shown]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with--		Average monthly	1 year in 10 will have--		Average number of days with snow cover	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than--	Minimum temperature equal to or lower than--		Less than--	More than--		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches		Inches
January	38	21	52	-1	1.93	1.0	2.7	17	5.2
February	45	26	57	9	1.86	1.0	3.0	11	5.7
March	55	30	70	20	2.39	1.1	4.1	3	2.1
April	65	36	82	27	2.82	1.4	4.6	(1/)	.2
May	74	42	91	34	3.05	1.3	5.6	---	---
June	81	48	94	40	2.89	1.7	4.4	---	---
July	92	52	103	43	.85	.2	1.7	---	---
August	91	49	102	42	.74	0	1.6	---	---
September	80	43	97	33	1.50	.3	2.8	---	---
October	65	37	83	26	2.46	.8	4.1	---	---
November	48	29	58	17	2.24	.9	3.5	1	2.1
December	40	25	51	9	1.99	1.0	3.3	11	3.4
Year	64	37	2/ 107	3/ -3	24.72	17.9	30.4	43	4.6

1/ Less than 1 day.

2/ Average annual highest maximum.

3/ Average annual lowest minimum.

Wind direction plays an important role in distribution of precipitation in the survey area. Precipitation generally is heavier on windward slopes than it is on the downwind side of mountain barriers.

Where the downward slope is to the north, it generally can be assumed that maximum precipitation is in spring. Where downward slope is to the west or southwest, maximum precipitation is likely to occur in December. The pattern of the rainfall distribution in the town of Kooskia closely follows that of Grangeville, Idaho, which is typical of the Camas Prairie to the west of the Area. In other parts of the survey area the distribution is more nearly like that of the central mountainous region of Idaho.

Air masses from the northwest moving toward the Kooskia Area lose much moisture as they travel across the mountain ranges. Thus Grangeville is in a more favorable location for receiving precipitation than Orofino, Pierce, and Fenn Ranger Station on the leeward side of the mountains. The rising air masses and surface heating cause uneven distribution of temperature and moisture throughout the Kooskia Area.

In general, precipitation is greatest in spring on sites within the survey area that slope to the north, and greatest in December on slopes that face to the west or southwest. Data on the percentage of annual precipitation occurring each month of the year indicate that precipitation is lightest during the months of July and August. The amount of precipitation ranges from slightly more than 2 percent in July at Orofino and Fenn Ranger Station to slightly less than 4 percent at Grangeville. During August precipitation ranged from slightly less than 2 percent at Orofino to slightly more than 3 percent at Grangeville. More than 12 percent of the annual total precipitation was received at Kooskia in May and at Orofino in December. At Kamiah 12 percent of the precipitation was received in June. Nearly 14 percent of the annual total precipitation was received at Pierce in December, and more than 14 percent was received at Grangeville in May. The Fenn Ranger Station received 12 percent of the annual total precipitation in November and December. The normal annual precipitation at each of the six stations follows:

	Inches
Kamiah	21.57
Kooskia	24.72
Fenn Ranger Station	36.45
Grangeville	22.65
Orofino	25.93
Pierce	41.34

The daily maximum and minimum temperatures in the survey area follow a normal seasonal pattern. Differences in temperature at weather stations serving the Area are related to differences in elevation, particularly the maximum temperatures. For example, average maximum temperatures in July at Kooskia and Grangeville, which have elevations of 1,261 and 3,355 feet, respectively, showed a difference of 10°. The average minimum temperatures at these two stations for July, however, were the same.

The growing season, which is the interval between the last temperature of 32° F., or lower, in spring and the first such temperature in fall, varies considerably. On the average, the growing season ranges from as little as 70 days at Pierce to 199 days at Fenn Ranger Station. The shortest growing season recorded in a period of 21 years was 12 days at Pierce in 1962. Freezing data for weather stations in and near the Kooskia Area are given in tables 10 and 11. In table 10 the average dates and the first and last dates of 32° F. and 28° F. temperatures in spring and fall are shown for four weather stations. The average length of the growing season is also shown in this table. In table 11 the probability of given temperatures, or colder, in spring and fall for specified dates are given for Kooskia and Nez Perce.

In the Kooskia area hail occurs mostly in spring, and the hailstones are small and soft. The occurrence of hail is infrequent, however, and little damage is caused by hail. During the period of March through June, hail was reported only 19 times in more than 50 years.

Thunderstorms occur more often than hailstorms, but even in July, the month of highest frequency, they were reported only on 65 days in a period of 52 years. In the eastern part of the survey area at higher elevations, the frequency of thunderstorms is undoubtedly somewhat higher, but data is not available for that part of the Area.

Flooding occurs occasionally along the Clearwater River and its tributaries. The floods come mostly in spring when the snowpack in the mountains melts rapidly. Damage from floods is chiefly to roads and bridges, though buildings may be damaged by major floods. Records of the U.S. Geological Survey at Kamiah, which is on the edge of the Area along the Clearwater River, show that the flood peak generally occurs in May.

TABLE 10.--AVERAGE DATE AND FIRST AND LAST DATES OF 32° F. AND 28° F. TEMPERATURES IN SPRING AND FALL AND LENGTH OF GROWING SEASON AT SPECIFIED STATIONS

32° F.

Station	Elevation	Average date of last in spring	Average date of first in fall	Average length of growing season	Earliest date of last in spring	Latest date of last in spring	Earliest date of first in fall	Latest date of first in fall
	Feet			Days				
Fenn Ranger Station---	1,580	May 4	October 9	159	April 16, 1957	June 2, 1951	September 7, 1939	October 29, 1960
Grangeville-	3,355	May 16	September 24	131	April 9, 1936	June 13, 1952	September 8, 1962	October 28, 1940
Kooskia-----	1,261	May 7	September 28	144	April 9, 1936	June 5, 1956	September 8, 1962	November 5, 1940
Pierce------	3,185	June 12	August 21	70	May 1, 1937	1/July 9, 1935	1/July 18, 1953	October 6, 1940

28° F.

Fenn Ranger Station---	1,580	April 12	October 28	199	March 17, 1958	May 29, 1951	October 6, 1952	November 16, 1958
Grangeville-	3,355	April 26	October 11	169	April 2, 1938	May 22, 1960	September 8, 1962	November 13, 1944
Kooskia-----	1,261	April 12	October 20	191	March 21, 1960	May 7, 1950	September 19, 1943	November 22, 1947
Pierce------	3,185	May 16	September 19	126				

1/ Cutoff date between spring and fall freeze dates is July 10.

TABLE 11.--PROBABILITIES OF GIVEN TEMPERATURES AND COLDER AFTER SPECIFIED DATES IN SPRING AND BEFORE SPECIFIED DATES IN FALL AT TWO STATIONS IN IDAHO

KOOSKIA

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than----------	March 14	March 28	April 14	May 3	May 26
2 years in 10 later than----------	March 7	March 21	April 7	April 26	May 20
5 years in 10 later than----------	February 18	March 6	March 27	April 12	May 7
Fall:					
1 year in 10 earlier than----------	November 16	October 28	October 17	October 2	September 9
2 years in 10 earlier than----------	November 23	November 3	October 23	October 7	September 15
5 years in 10 earlier than----------	December 7	November 17	November 5	October 20	September 28

NEZ PERCE

Spring:					
1 year in 10 later than----------	April 1	April 8	April 26	May 18	June 18
2 years in 10 later than----------	March 24	April 1	April 19	May 11	June 11
5 years in 10 later than----------	March 7	March 18	April 5	April 27	May 28
Fall:					
1 year in 10 earlier than----------	November 6	October 23	October 13	September 16	August 30
2 years in 10 earlier than----------	November 13	October 29	October 19	September 23	September 6
5 years in 10 earlier than----------	November 25	November 11	November 1	October 6	September 19

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LITERATURE CITED

(1) American Association of State Highway Officials.
1961. Standard Specifications for Highway Materials and Methods of Sampling and Testing. Ed. 8, 2 pts., illus.

(2) Anderson, Alfred L.
1930. The Geology and Mineral Resources of the Region About Orofino, Idaho. Idaho Bureau of Mines and Geology, Pamphlet 34, 63 pp., illus.

(3) Association of Official Agricultural Chemists.
1945. Official and Tentative Methods of Analysis. Ed. 6, 932 pp. Washington, D.C.

(4) Baldwin, Mark, Kellogg, Charles E., and Thorp, James.
1938. Soil Classification. U.S. Dept. Agr. Ybk. 1938: 979-1001.

(5) Bender, William H.
1961. Soils Suitable for Septic Tank Filter Fields. U.S. Dept. Agr. Inf. Bul. 243, 12 pp., illus.

(6) Elsensohn, M. Alfreda.
1947. Pioneer Days in Idaho County. 2 v., 527 and 558 pp., illus.

(7) Haig, Irvine T.
1932. Second-growth Yield, Stand, and Volume Tables for the Western White Pine Type. Dept. Agr. Tech. Bul. 323, 68 pp.

(8) Meyer, Walter H.
1938. Yield of Even-aged Stands of Ponderosa Pine. Dept. Agr. Tech. Bul. 630, 60 pp., illus.

(9) Shockley, Dale R.
1955. Capacity of Soil to Hold Moisture. Agricultural Engineering 36, No. 2: 109-112, illus.

(10) Simonson, Roy W.
1963. Soil Correlation and the New Classification System. Soil Sci. 96: 23-30.

(11) Thorp, James and Smith, Guy D.
1949. Higher Categories of Soil Classification: Order, Suborder, and Great Soil Groups. Soil Sci. 67: 117-126, illus.

(12) United States Department of Agriculture.
1951. Soil Survey Manual. U.S. Dept. Agr. Handbook 18, 503 pp., illus.

(13) _____.
1954. Diagnosis and Improvement of Saline and Alkali Soils. U.S. Salinity Laboratory. U.S. Dept. Agr. Handbook 60, 160 pp.

(14) _____.
1960. Soil Classification, A Comprehensive System. 7th Approximation. Soil Survey Staff, Soil Conservation Service, 265 pp., illus. (Supplement issued in March 1967.)

(15) United States Department of Defense.
1968. System for Roads, Airfields, embankments, and Foundations. MIL-STD-619B. 30 pp., illus.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Bottom land. Nearly level land on the bottom of a valley that has a stream running through it. Subject to flooding and often referred to as a flood plain.

Clay As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are--

Loose.--Noncoherent when dry or moist; does not hold together in a mass.

Friable.--When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.--When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.--When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.--When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.--When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.--When dry, breaks into powder or individual grains under very slight pressure.

Cemented.--Hard and brittle; little affected by moistening.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material that can be used as feed by domestic animals. It may be grazed or cut for hay.

Gravel. Rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.--The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.--The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.--The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.--The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.--Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Igneous rock. Rock that has been formed by the cooling of molten mineral material. Examples: Granite, syenite, diorite, and basalt.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Metamorphic rocks. Rocks of any origin that have been completely changed physically by heat,

pressure, and movement. Such rocks are nearly always crystalline.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct, and prominent. The size measurements are these: fine, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and coarse, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Mulch tillage. Tillage or preparation of the soil in such a way that plant residue is left on the surface.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the elaboration of its food and tissue. Among the elements obtained from the soil are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc. Plant nutrients obtained largely from the air and water, are carbon, hydrogen, and oxygen.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rotation grazing. Grazing two or more pastures, or parts of a range, in regular order, with definite recovery periods between grazing periods. Contrasts with continuous grazing.

Runoff. Refers to the amount of water removed by flow over the surface of the soil. The amount and rapidity of runoff are affected by factors, such as texture, structure, and porosity of the surface soil; the vegetative covering; the prevailing climate; and the slope. The degree of runoff is expressed by the terms very rapid, rapid, medium, slow, very slow, and ponded.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

Slope. The incline of the surface of a soil. It is usually expressed in percentage of slope, which equals the number of feet of rise per 100 feet of horizontal distance.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: Very coarse sand (2.0 to 1.0 millimeter); coarse sand (1.0 to 0.5 millimeter); medium sand (0.5 to 0.25 millimeter); fine sand (0.25 to 0.10 millimeter); very fine sand (0.10 to 0.05 millimeter); silt (0.05 to 0.002 millimeter); and clay (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons.

Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are--platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are (1) single grain (each grain by itself, as in dune sand) or (2) massive (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Stubble mulch. Stubble or other crop residues left on the soil, or partly worked into the soil, to provide protection from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Subsurface tillage. Tillage with a sweeplike plow or blade that does not turn over the surface cover or incorporate it into the lower part of the surface soil.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Variant, soil. A soil that has properties sufficiently different from those of other known soils to justify a new series name, but of such limited geographic area that establishing a new series cannot be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Absence of information in the range site and woodland group columns indicates that the soil is not suited for the stated use. In referring to a capability unit, a woodland group, or a range site, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 8.
Estimated yields, table 2, page 42.

Ratings and limitations of soils for recreational purposes, table 3, page 57.
Engineering uses of soils, tables 4, 5, and 6, pages 62 through 77.

Map symbol	Mapping unit	Described on page	Capability unit		Range site		Woodland group	
			Symbol	Page	Name	Page	Number	Page
BcE	Brody cobbly silt loam, 35 to 65 percent slopes	7	VIIe-1	41		--	3	51
CaA	Caribel silt loam, 0 to 7 percent slopes	9	IIIe-1	40		--	2	51
CaB	Caribel silt loam, 7 to 12 percent slopes	10	IIIe-1	40		--	2	51
CaC	Caribel silt loam, 12 to 25 percent slopes	10	IVe-1	40		--	2	51
CaC2	Caribel silt loam, 12 to 25 percent slopes, eroded	11	IVe-1	40		--	--	--
CaD	Caribel silt loam, 25 to 45 percent slopes	11	VIe-1	41		--	2	51
Co	Colville loam, noncalcareous variant	11	IIIw-1	40		--	--	--
GcC	Greencreek loam, 5 to 30 percent slopes	12	IVe-1	40		--	1	51
GkE	Gwin-Klicker stony loams, 40 to 65 percent slopes	14						
	Gwin part	--	VIIe-1	41	South Slope	45	--	--
	Klicker part	--	VIIe-1	41		--	4	52
GmD	Gwin-Mehlhorn stony loams, 12 to 45 percent slopes	15	VIe-2	41	Loamy	45	--	--
GmE	Gwin-Mehlhorn stony loams, 45 to 65 percent slopes	15	VIIe-1	41	South Slope	45	--	--
GsE	Gwin-Sallyann stony loams, 35 to 65 percent slopes	15						
	Gwin part	--	VIIe-1	41	South Slope	45	--	--
	Sallyann part	--	VIIe-1	41		--	4	52
HeA	Helmer silt loam, 0 to 7 percent slopes	16	IVe-1	40		--	7	52
HeB	Helmer silt loam, 7 to 12 percent slopes	17	IVe-1	40		--	7	52
HeC	Helmer silt loam, 12 to 25 percent slopes	17	IVe-1	40		--	7	52
HeD	Helmer silt loam, 25 to 45 percent slopes	17	VIe-1	41		--	7	52
HmC	Helmer silt loam, loamy variant, 5 to 20 percent slopes	17	IVe-1	40		--	7	52
JaB	Jacknife silt loam, 7 to 12 percent slopes	19	IIIe-1	40	Loamy	45	--	--
JaC	Jacknife silt loam, 12 to 25 percent slopes	20	IVe-1	40	Loamy	45	--	--
JaC2	Jacknife silt loam, 12 to 25 percent slopes, eroded	20	IVe-1	40	Loamy	45	--	--
JaD	Jacknife silt loam, 25 to 45 percent slopes	20	VIe-2	41	Loamy	45	--	--
JcA	Jacknife silt loam, loamy variant, 0 to 7 percent slopes	21	IIe-1	40	Loamy	45	--	--
JcB	Jacknife silt loam, loamy variant, 7 to 12 percent slopes	21	IIIe-1	40	Loamy	45	--	--
JcC	Jacknife silt loam, loamy variant, 12 to 25 percent slopes	21	IIIe-1	40	Loamy	45	--	--
JcC2	Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded	21	IIIe-1	40	Loamy	45	--	--
JmD	Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes	20	VIe-2	41	Loamy	45	--	--
JmD2	Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes, eroded	20	VIe-2	41	Loamy	45	--	--
JuD	Jughandle sandy loam, 12 to 35 percent slopes	23	VIe-1	41		--	8	53
JuE	Jughandle sandy loam, 35 to 65 percent slopes	22	VIIe-1	41		--	8	53
KcD	Klicker rocky silt loam, 12 to 40 percent slopes	24	VIs-1	41		--	4	52
KcE	Klicker rocky silt loam, 40 to 65 percent slopes	23	VIIs-1	41		--	4	52
KoA	Kooskia silt loam, 0 to 7 percent slopes	24	IIIe-1	40		--	1	51
KoB	Kooskia silt loam, 7 to 12 percent slopes	26	IIIe-1	40		--	1	51
KoB2	Kooskia silt loam, 7 to 12 percent slopes, eroded	26	IVe-1	40		--	--	--
KoC	Kooskia silt loam, 12 to 25 percent slopes	26	IVe-1	40		--	1	51
KoC2	Kooskia silt loam, 12 to 25 percent slopes, eroded	26	IVe-1	40		--	--	--
LoE	Lochsa sandy loam, 25 to 65 percent slopes	27	VIIe-1	41		--	9	53
LsF	Lochsa soils, 65 to 90 percent slopes	28	VIIe-1	41		--	9	53
LuE	Lochsa-Yakus sandy loams, 30 to 65 percent slopes	28						
	Lochsa part	--	VIIe-1	41		--	9	53
	Yakus part	--	VIIe-1	41	Granitic South Slope	46	--	--
LyE	Lochsa-Yakus rocky complex, 30 to 65 percent slopes	28						
	Lochsa part	--	VIIs-1	41		--	5	52
	Yakus part	--	VIIs-1	41	Granitic South Slope	46	--	--
MgD	Mehlhorn-Gwin loams, 25 to 45 percent slopes	28	VIe-2	41	Loamy	45	--	--
Mn	Mixed alluvial land	29	VIIIw-1	41		--	--	--
MoC	Molly loam, 12 to 30 percent slopes	29	VIe-1	41		--	10	53
MoE	Molly loam, 30 to 65 percent slopes	30	VIIe-1	41		--	10	53
NcA	Nicodemus loam, 0 to 7 percent slopes	31	IIe-1	40		--	--	--
NcB	Nicodemus loam, 7 to 12 percent slopes	31	IIIe-1	40		--	--	--
PoA	Potlatch silt loam, 0 to 7 percent slopes	32	IIIw-1	40		--	--	--
PrC	Potlatch-Greencreek loam, 7 to 25 percent slopes	33						
	Potlatch part	--	IVe-1	40		--	7	52
	Greencreek part	--	IVe-1	40		--	1	51
Re	Riverwash	33	VIIIw-1	41		--	--	--
Rk	Rock land	33	VIIIs-1	41	South Slope	45	4	52
Ro	Rock outcrop	33	VIIIs-1	41		--	--	--
SaE	Sallyann stony loam, 30 to 65 percent slopes	34	VIIe-1	41		--	4	52
SuB	Suttler loam, 7 to 12 percent slopes	35	IIIe-1	40		--	8	53
SuC	Suttler loam, 12 to 30 percent slopes	35	VIe-1	41		--	8	53
SuE	Suttler loam, 30 to 65 percent slopes	36	VIIe-1	41		--	8	53
WeB	Weedmark silt loam, 7 to 12 percent slopes	37	IIIe-1	40		--	6	52
WmC	Weedmark loam, 12 to 25 percent slopes	36	IVe-1	40		--	6	52
WmC2	Weedmark loam, 12 to 25 percent slopes, eroded	37	IVe-1	40		--	6	52
WmD	Weedmark loam, 25 to 45 percent slopes	37	VIe-1	41		--	6	52
YaD	Yakus coarse sandy loam, 12 to 40 percent slopes	38	VIe-2	41	Granitic	46	--	--
YaE	Yakus coarse sandy loam, 40 to 65 percent slopes	37	VIIe-1	41	Granitic South Slope	46	--	--
YlE	Yakus-Lochsa sandy loams, 40 to 65 percent slopes	38						
	Yakus part	--	VIIe-1	41	Granitic South Slope	46	--	--
	Lochsa part	--	VIIe-1	41		--	5	52

411-369 O - 71 (Face maps) No. 1

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SOIL ASSOCIATIONS

1. Kooskia-Caribel association: Deep and very deep, nearly level to steep soils that have a surface layer of silt loam and a subsoil of silt loam to silty clay; on broad ridgetops
2. Lochsa-Yakus association: Very deep to shallow, moderately steep to very steep soils that are coarse sandy loam or loam throughout; on canyon sides
3. Suttler association: Deep, rolling to very steep soils that are dominantly loam throughout; on uplands
4. Jughandle association: Deep or very deep, hilly to very steep soils that are dominantly sandy loam throughout; on uplands
5. Klicker-Gwin-Mehlhorn association: Moderately deep and shallow, hilly to very steep, stony and rocky soils that have a surface layer of silt loam and loam and a subsoil of silt loam to silty clay loam; on canyon sides
6. Molly association: Deep and very deep, hilly to very steep soils that have a surface layer of loam and a subsoil of loam or silt loam; on uplands
7. Helmer-Brody association: Very deep to moderately deep, undulating to very steep soils that have a surface layer of silt loam and a subsoil of silt loam and silty clay loam; on uplands

January 1971

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

UNIVERSITY OF IDAHO COLLEGE OF AGRICULTURE
IDAHO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

KOOSKIA AREA, IDAHO

Scale 1:190,080

1 0 1 2 3 4 Miles

NOTE—

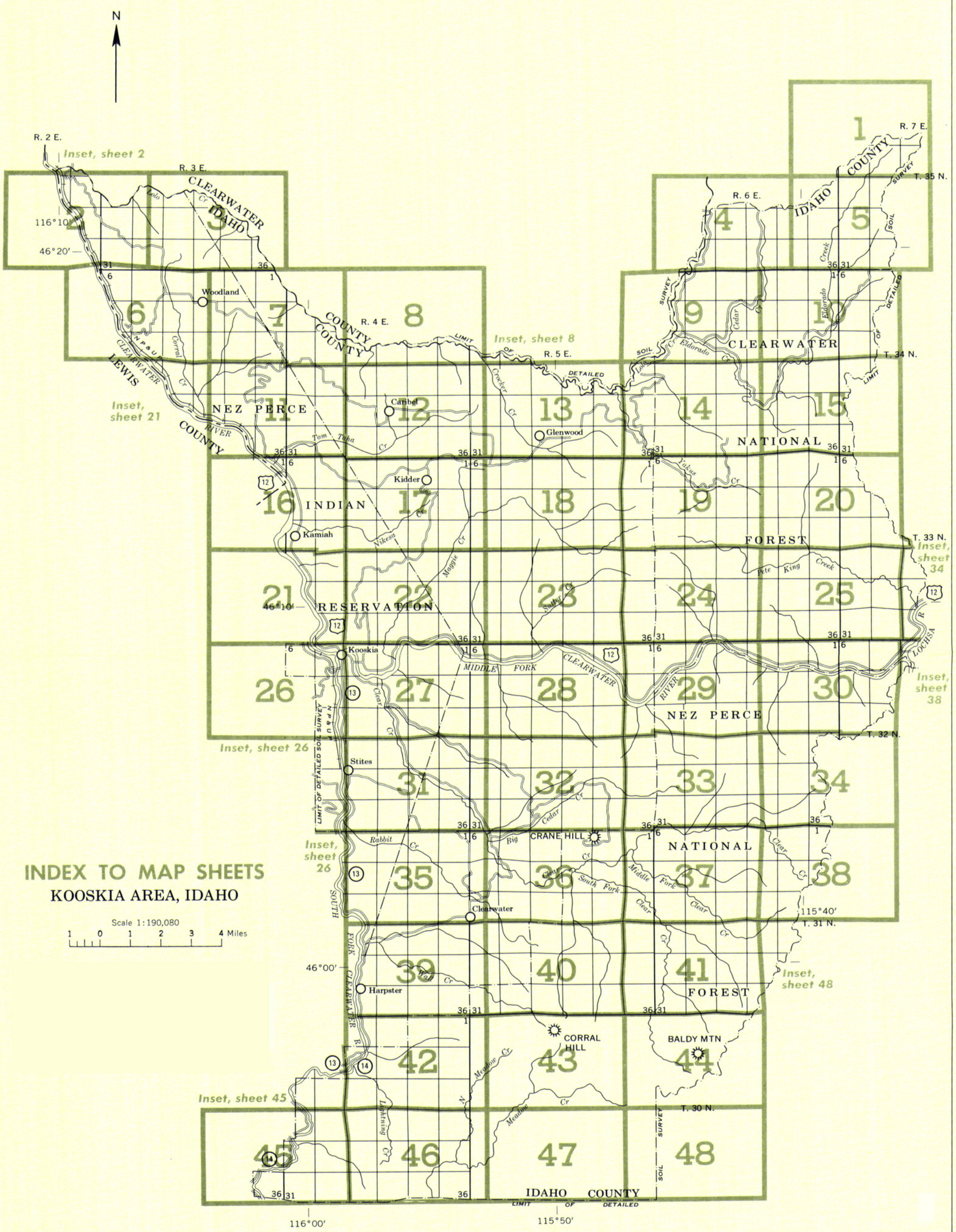
This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning.

INDEX TO MAP SHEETS

KOOSKIA AREA, IDAHO

Scale 1:190,080

1 0 1 2 3 4 Miles



Original text from each individual map sheet read:

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and Forest Service, the United States Department of the Interior, Bureau of Indian Affairs, and the University of Idaho, College of Agriculture, Idaho Agricultural Experiment Station. Photobase from 1954 aerial photographs. 5,000-foot grid ticks based on Idaho plane coordinate system, west zone. 1927 North American datum. Land division corners are approximately positioned on this map.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE AND FOREST SERVICE

KOOSKIA AREA, IDAHO

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
UNIVERSITY OF IDAHO COLLEGE OF AGRICULTURE
IDAHO AGRICULTURAL EXPERIMENT STATION

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Sawmill

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Project area
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Cobble

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the class of slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for land types that have a considerable range of slope. A final number, 2, in the symbol shows that the soil is eroded.

SYMBOL	NAME
BcE	Brody cobbly silt loam, 35 to 65 percent slopes
CaA	Caribel silt loam, 0 to 7 percent slopes
CaB	Caribel silt loam, 7 to 12 percent slopes
CaC	Caribel silt loam, 12 to 25 percent slopes
CaC2	Caribel silt loam, 12 to 25 percent slopes, eroded
CaD	Caribel silt loam, 25 to 45 percent slopes
Co	Colville loam, noncalcareous variant
GcC	Greencreek loam, 5 to 30 percent slopes
GkE	Gwin-Klicker stony loams, 40 to 65 percent slopes
GmD	Gwin-Mehlhorn stony loams, 12 to 45 percent slopes
GmE	Gwin-Mehlhorn stony loams, 45 to 65 percent slopes
GsE	Gwin-Sallyann stony loams, 35 to 65 percent slopes
HeA	Helmer silt loam, 0 to 7 percent slopes
HeB	Helmer silt loam, 7 to 12 percent slopes
HeC	Helmer silt loam, 12 to 25 percent slopes
HeD	Helmer silt loam, 25 to 45 percent slopes
HmC	Helmer silt loam, loamy variant, 5 to 20 percent slopes
JaB	Jacknife silt loam, 7 to 12 percent slopes
JaC	Jacknife silt loam, 12 to 25 percent slopes
JaC2	Jacknife silt loam, 12 to 25 percent slopes, eroded
JaD	Jacknife silt loam, 25 to 45 percent slopes
JcA	Jacknife silt loam, loamy variant, 0 to 7 percent slopes
JcB	Jacknife silt loam, loamy variant, 7 to 12 percent slopes
JcC	Jacknife silt loam, loamy variant, 12 to 25 percent slopes
JcC2	Jacknife silt loam, loamy variant, 12 to 25 percent slopes, eroded
JmD	Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes
JmD2	Jacknife-Mehlhorn silt loams, 25 to 45 percent slopes, eroded
JuD	Jughandle sandy loam, 12 to 35 percent slopes
JuE	Jughandle sandy loam, 35 to 65 percent slopes
KcD	Klicker rocky silt loam, 12 to 40 percent slopes
KcE	Klicker rocky silt loam, 40 to 65 percent slopes
KoA	Kooskia silt loam, 0 to 7 percent slopes
KoB	Kooskia silt loam, 7 to 12 percent slopes
KoB2	Kooskia silt loam, 7 to 12 percent slopes, eroded
KoC	Kooskia silt loam, 12 to 25 percent slopes
KoC2	Kooskia silt loam, 12 to 25 percent slopes, eroded
LoE	Lochsa sandy loam, 25 to 65 percent slopes
LsF	Lochsa soils, 65 to 90 percent slopes
LuE	Lochsa-Yakus sandy loams, 30 to 65 percent slopes
LyE	Lochsa-Yakus rocky complex, 30 to 65 percent slopes
MgD	Mehlhorn-Gwin loams, 25 to 45 percent slopes
Mn	Mixed alluvial land
MoC	Molly loam, 12 to 30 percent slopes
MoE	Molly loam, 30 to 65 percent slopes
NcA	Nicodemus loam, 0 to 7 percent slopes
NcB	Nicodemus loam, 7 to 12 percent slopes
PoA	Potlatch silt loam, 0 to 7 percent slopes
PrC	Potlatch-Greencreek loam, 7 to 25 percent slopes
Re	Riverwash
Rk	Rock land
Ro	Rock outcrop
SaE	Sallyann stony loam, 30 to 65 percent slopes
SuB	Suttler loam, 7 to 12 percent slopes
SuC	Suttler loam, 12 to 30 percent slopes
SuE	Suttler loam, 30 to 65 percent slopes
WeB	Weedmark silt loam, 7 to 12 percent slopes
WmC	Weedmark loam, 12 to 25 percent slopes
WmC2	Weedmark loam, 12 to 25 percent slopes, eroded
WmD	Weedmark loam, 25 to 45 percent slopes
YaD	Yakus coarse sandy loam, 12 to 40 percent slopes
YaE	Yakus coarse sandy loam, 40 to 65 percent slopes
YlE	Yakus-Lochsa sandy loams, 40 to 65 percent slopes

KOOSKIA AREA, IDAHO — SHEET NUMBER 1

525 000 FEET

540 000 FEET

1725 000 FEET

1715 000 FEET

T. 35 N.

SURVEY

PACK TRAIL

SOIL DETAILED

Ridge

8

9

JuE

JuD

Pete Forks

16

OF TRAIL LIMIT

PACK

Austin

18

Creek

17

C L E A R W A T E R

Eldorado

N A T I O N A L F O R E S T

LOLO TRAIL DETAILED SOIL SURVEY

LIMIT

R. 6 E. | R. 7 E.

(Joins sheet 5)

1

N

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

KOOSKIA AREA, IDAHO — SHEET NUMBER 10

10

N

R. 6 E. | R. 7 E.

(Joins sheet 4) | (Joins sheet 5)

520 000 FEET

535 000 FEET

1695 000 FEET

1685 000 FEET

T. 34 N.

(Joins sheet 9)

(Joins sheet 15)

1 Mile

5 000 Feet

Scale 1:20 000

0 0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

C L E A R W A T E R N A T I O N A L F O R E S T

Cedar Creek

Wapiti Cr

Co

MoC

JuE

JuD

Cedar Creek

May Creek

Dollar Creek

Eldorado Creek

Two-bit Creek

Four-bit Creek

Done Cr

Era Creek

Ridge

DETAILED SOIL SURVEY

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

KOOSKIA AREA, IDAHO — SHEET NUMBER 11

11

N

R. 3 E. | R. 4 E.

T. 34 N.

425 000 FEET

440 000 FEET

1680 000 FEET

1670 000 FEET

(Joins inset, sheet 21)

(Joins sheet 7)

(Joins sheet 12)

(Joins sheet 16)

NEZ PERCE INDIAN RESERVATION

Hollingsworth Canyon

Wall Canyon

Tom Taha Creek

IDAHO COUNTY

LEWIS COUNTY

NORTHERN PACIFIC

CLEARWATER RIVER

UNION PACIFIC

1 Mile

5 000 Feet

Scale 1:20 000

12

N

445 000 FEET

(Joins sheet 8)

R. 4 E. | R. 5 E.

465 000 FEET

1680 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

1¼ 5 000

1670 000 FEET

T. 34 N.

(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 17)

Caribel

Tom Taha Creek

21 22 23 24 19

28 27 26 25 30

33 34 35 36 31

WmC WmD WeB LoE KoA KoB KoC KoC2 KoB2 KcE KcD CaB CaA CaC CaD HeA HeB HeC HeD BcE PoA GmD GmE JmD JaC JaD YaD YaE

KOOSKIA AREA, IDAHO — SHEET NUMBER 13

(Joins inset, sheet 8)

470 000 FEET

R. 5 E.

490 000 FEET

1680 000 FEET

T. 34 N.

1670 000 FEET

Crocker Creek

Loto Creek

CLEARWATER COUNTY OF IDAHO

LIMIT OF DETAILED SOIL SURVEY

Glenwood

Creek

19 20 21 22 23 26 27 28 29 30 31 32 33 34 35

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 18)

13

N

1 Mile

5 000 Feet

Scale 1:20 000

N

R. 5 E. | R. 6 E.

(Joins sheet 9)

495 000 FEET

515 000 FEET

1680 000 FEET

1670 000 FEET

T. 34 N.

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 19)

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

CLEARWATER NATIONAL FOREST

CLEARWATER COUNTY SOIL SURVEY DETAILED

LIMIT OF IDAHO

Lolo Creek

North Fork Mud Creek

Buckner Creek

Opal Creek

Snow Cr

Eva Creek

Eldorado Creek

Kate Cr

Panther Creek

Brick Creek

Lynx Creek

Molly Creek

Mud Creek

Yanus

19 20 21 22

24 25 27

28 29 30

31 32 33 34

36

BcE CaB Co GmE HeB HeC HeD HmC JuD JuE KcE MoC MoE NcA Ro SuC SuE

KOOSKIA AREA, IDAHO — SHEET NUMBER 15

15

N

(Joins sheet 10)

R. 6 E. | R. 7 E.

520 000 FEET

535 000 FEET

1680 000 FEET

1670 000 FEET

T. 34 N.

(Joins sheet 14)

(Joins sheet 20)

Eldorado Ridge

Kate Creek

Trout Creek

Lunch Creek

Four-bit Cr.

Fan Creek

Eldorado Creek

Walde Creek

C L E A R W A T E R N A T I O N A L F O R E S T

LIMIT OF DETAILED SOIL SURVEY

Fan Creek Saddle

Walde Mountain Lookout Station

19 20 22 23 24 25 26 27 30 31 34 35 36

JuE JuD Co Mn SuC SuE

1 Mile

5000 Feet

Scale 1:20 000

16

N

1 Mile 5 000 Feet

Scale 1:20 000

425 000 FEET

440 000 FEET

1665 000 FEET

1655 000 FEET

R. 3 E. | R. 4 E.

T. 33 N.

(Joins sheet 11)

(Joins sheet 17)

(Joins sheet 21)

LEWIS COUNTY

IDAHO COUNTY

CLEARWATER RIVER

DETAILED SOIL SURVEY LIMIT OF

NEZ PERCE INDIAN RESERVATION

KAMIAH

Nikesa Creek

1 2 5 6 7 8 17 18

JaB JaC JaC2 JaD JcA JcB JcC JeB JmD JmD2 KcD KcE KoA KoB KoB2 KoC KoC2 KpB NcA Re Ro GmD GmE

17

N

R. 4 E. | R. 5 E.

(Joins sheet 12)

445 000 FEET

465 000 FEET

1665 000 FEET

1655 000 FEET

1650 000 FEET

T. 33 N.

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 22)

Kidder

N E Z P E R C E

I N D I A N

R E S E R V A T I O N

Church

Canyon Creek

Nikesa Ridge

Kidde

Maggie Creek

Harris Ridge

1 Mile 5 000 Feet

Scale 1:20 000

(18)

N

R. 5 E.

T. 33 N.

470 000 FEET

490 000 FEET

1665 000 FEET

1650 000 FEET

(Joins sheet 13)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 23)

1 Mile

5 000 Feet

Scale 1:20 000

HARRIS RIDGE

Maggie Butte

Maggie Creek

Crocker Creek

Cabin Creek

North Fork Maggie Creek

GmE Creek

JuD Creek

Rk

1 2 3 4 5 6 7 8 9 10 11 14 15 16 17 18

N

R. 5 E. | R. 6 E.

495 000 FEET

515 000 FEET

1665 000 FEET

1650 000 FEET

T. 33 N.

(Joins sheet 14)

(Joins sheet 20)

(Joins sheet 18)

(Joins sheet 24)

Lookout Station

C L E A R W A T E R N A T I O N A L F O R E S T

Molly Creek

Yakus Creek

Nan Creek

Spray Creek

Rat Creek

Maggie Cr

Woodrat Mountain

Pete King Creek

JEEP TRAIL

1 Mile

5 000 Feet

Scale 1:20 000

KOOSKIA AREA, IDAHO — SHEET NUMBER 2

(2)

N

1 Mile 5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

390 000 FEET

1710 000 FEET

1700 000 FEET

R. 2 E. | R. 3 E.

410 000 FEET

(Joins inset)

T. 35 N.

1717 000 FEET

1715 000 FEET

395 000 FEET

400 000 FEET

(Joins upper right)

2000 AND 5000-FOOT GRID TICKS

CLEARWATER COUNTY

IDAHO CO

LEWIS COUNTY

CLEARWATER R.

NP RR

LIMIT OF DETAILED SOIL SURVEY

Lolo Creek

NEZ PERCE INDIAN RES

CLEARWATER RIVER

NORTHERN PACIFIC RR

UNION PACIFIC RR

IDAHO COUNTY

LEWIS COUNTY

N E Z P E R C E I N D I A N R E S E R V A T I O N

LoE JcB YIE YaD YaE WmD WmC WeB KoC KoB Ro

23 24 25 19 20 29 30 31 32 36

(Joins sheet 3)

(Joins sheet 6)

KOOSKIA AREA, IDAHO — SHEET NUMBER 20

20

N

(Joins sheet 15)

520 000 FEET

R. 6 E. | R. 7 E.

535 000 FEET

1665 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

(Joins sheet 19)

T. 33 N.

JuE SuE SuC JuD

1 2 3 6 7 8 10 11 12 13 14 15 17 18

C L E A R W A T E R N A T I O N A L F O R E S T

Creek Walde Creek Polar Creek Higgins Creek Nut Creek Placer Creek

PACK TRAIL PACK TRAIL

Higgins Hump

Jungle Point

LIMIT OF DETAILED SURVEY

520 000 FEET

535 000 FEET

(Joins sheet 25) | (34)

21

N

425 000 FEET

1650 000 FEET

T. 33 N.

T. 34 N.

410 000 FEET

R. 3 E.

(Joins sheet 6)

420 000 FEET

1680 000 FEET

1675 000 FEET

1635 000 FEET

(Joins sheet 11)

(Joins sheet 16)

R. 4 E.

440 000 FEET

(Joins sheet 22)

(Joins sheet 26)

NEZ PERCE INDIAN RESERVATION

LEWIS COUNTY

IDAHO

NORTHERN PACIFIC

CLEARWATER RIVER

Coral Creek

UNION PACIFIC

DETACHED SOIL SURVEY

YaD YaE KoC2 JmD2 GmE GmD KcE Ro JcB JcC JaB JaC JaD JbD JcA JcB NcA Re Rk KoA KoB KoC JaC2 JgC2 GmD

20 21 22 19 28 27 29 30 32 12

1 Mile

5 000 Feet

Scale 1:20 000

0 0 ¼ 1 000 ½ 2 000 ¾ 4 000 1 5 000

3000 AND 5000-FOOT GRID TICKS

N

445 000 FEET

(Joins sheet 17)

R. 4 E. | R. 5 E.

465 000 FEET

1645 000 FEET

(Joins sheet 21)

1 Mile

5 000 Feet

0

Scale 1:20 000

1 000

2 000

3 000

4 000

5 000

1635 000 FEET

445 000 FEET

(Joins sheet 27)

Maggie Bend

MIDDLE FORK CLEARWATER RIVER

(Joins sheet 23)

T. 33 N.

GmE KcE GmE NcA

GmE

N

470 000 FEET

490 000 FEET

1645 000 FEET

1635 000 FEET

R. 5 E.

T. 33 N.

(Joins sheet 18)

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 28)

Harris Creek

Maggie Ridge Creek

Sutter Creek

Wilson Creek

19 20 21 22 23 30 29 28 27 26 31 32 33 34 35

1 Mile 5000 Feet

Scale 1:20 000

0 0 ¼ 1 000 ½ 2 000 ¾ 3 000 1 4 000 5 000

KOOSKIA AREA, IDAHO — SHEET NUMBER 24

24

N

1 Mile 5 000 Feet

Scale 1:20 000

R. 5 E. | R. 6 E. (Joins sheet 19)

T. 33 N.

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 29)

495 000 FEET

510 000 FEET

1645 000 FEET

1635 000 FEET

CLEARWATER NATIONAL FOREST

Woodrat Mountain

Lookout Station

Pete King Creek

Smith Saddle

Big Little Smith Creek

Wilson Creek

Swan Creek

Syringa Creek

King Creek

M F CLEARWATER R

Syringa

12

19 20 21 22 24 25 27 28 29 30 31 32 33 34 36

SuE SuC LoE MoE LsF LyE GcC

KOOSKIA AREA, IDAHO — SHEET NUMBER 25

25

N

520 000 FEET

535 000 FEET

(Joins sheet 20)

R. 6 E. | R. 7 E.

1645 000 FEET

1635 000 FEET

T. 33 N.

(Joins sheet 24)

(Joins inset, sheet 34)

(Joins sheet 30)

C L E A R W A T E R N A T I O N A L F O R E S T

Big Hill

Pete King Creek

Walde Cr

Higgins Cr

Pack Trail

Placer Creek

Nut Creek

Syringa Cr

Bridge Creek

Three Devils Creek

Lowell Creek

22 23 24 19 20 27 26 25 30 29 35 36 31 32 34

SuE SuC JuE LoE Mn LyE MoE

1 Mile

5 000 Feet

Scale 1:20 000

0 0

1/4 1 000

1/2 2 000

3/4 3 000

1 4 000

5 000


26
N
(Joins inset A, lower right)
(Joins inset 26, lower right)
(Joins sheet 21)
1 Mile
5 000 Feet
Scale 1:20 000
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000
440 000 FEET
443 000 FEET
435 000 FEET
1600 000 FEET
1590 000 FEET
1615 000 FEET
1605 000 FEET
1630 000 FEET
1620 000 FEET
T. 31 N.
T. 32 N.
R. 4 E.
INSET B
INSET A
3000 AND 5000-FOOT GRID TICKS
SOUTH FORK CLEARWATER RIVER
NORTH FORK CLEARWATER RIVER
NEZ PERCE INDIAN RESERVATION
KOOSKIA
Stites
Mt Stewart
Clearwater Valley High Sch
Cottonwood Creek
(Joins sheet 35)
(Joins sheet 31)
(Joins sheet 27)
(Joins inset B, upper left)
(Joins inset A, left)
GmE
GmD
JaD
JaC
JaB
JcA
JcC
JcC2
JcB
KcE
KcD
KoB
KoC
JaC2
JmD
NcA
Re
Rk
Ro
DETAILED SOIL SURVEY
LIMIT OF DETAILED SOIL SURVEY
NORTHERN PACIFIC

KOOSKIA AREA, IDAHO — SHEET NUMBER 27

27

N

R. 4 E. | R. 5 E.

445 000 FEET

465 000 FEET

1630 000 FEET

1620 000 FEET

T. 32 N.

(Joins sheet 22)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 31)

KOOSKIA

MIDDLE FORK CLEARWATER RIVER

CLEARWATER RIVER

Mission Creek

Battle Ridge

PINE GROVE CEMETERY

Mt Stewart

N E Z P E R C E

I N D I A N R E S E R V A T I O N

T A H O E R I D G E

Leitch Creek

Creek

1 Mile

5 000 Feet

Scale 1:20 000

28

N

470 000 FEET

(Joins sheet 23)

R. 5 E.

490 000 FEET

1630 000 FEET

MIDDLE FORK CLEARWATER RIVER

Wilson Cr.

Stiller Creek

Big Horse Canyon Creek

(Joins sheet 27)

T. 32 N.

(Joins sheet 29)

1620 000 FEET

(Joins sheet 32)

Scale 1:20 000

1 Mile

5 000 Feet

1 000

2 000

3 000

4 000

5 000

R. 5 E. | R. 6 E.

495 000 FEET

510 000 FEET

1630 000 FEET

1620 000 FEET

T. 32 N.

(Joins sheet 24)

(Joins sheet 30)

(Joins sheet 28)

(Joins sheet 33)

N

Scale 1:20 000

1 Mile

5 000 Feet

CLEARWATER NATIONAL FOREST

NEZ PERCE NATIONAL FOREST

CLEARWATER RIVER

MIDDLE FORK

Syringa

Indian Rapids

Number One Creek

Little Tinker Creek

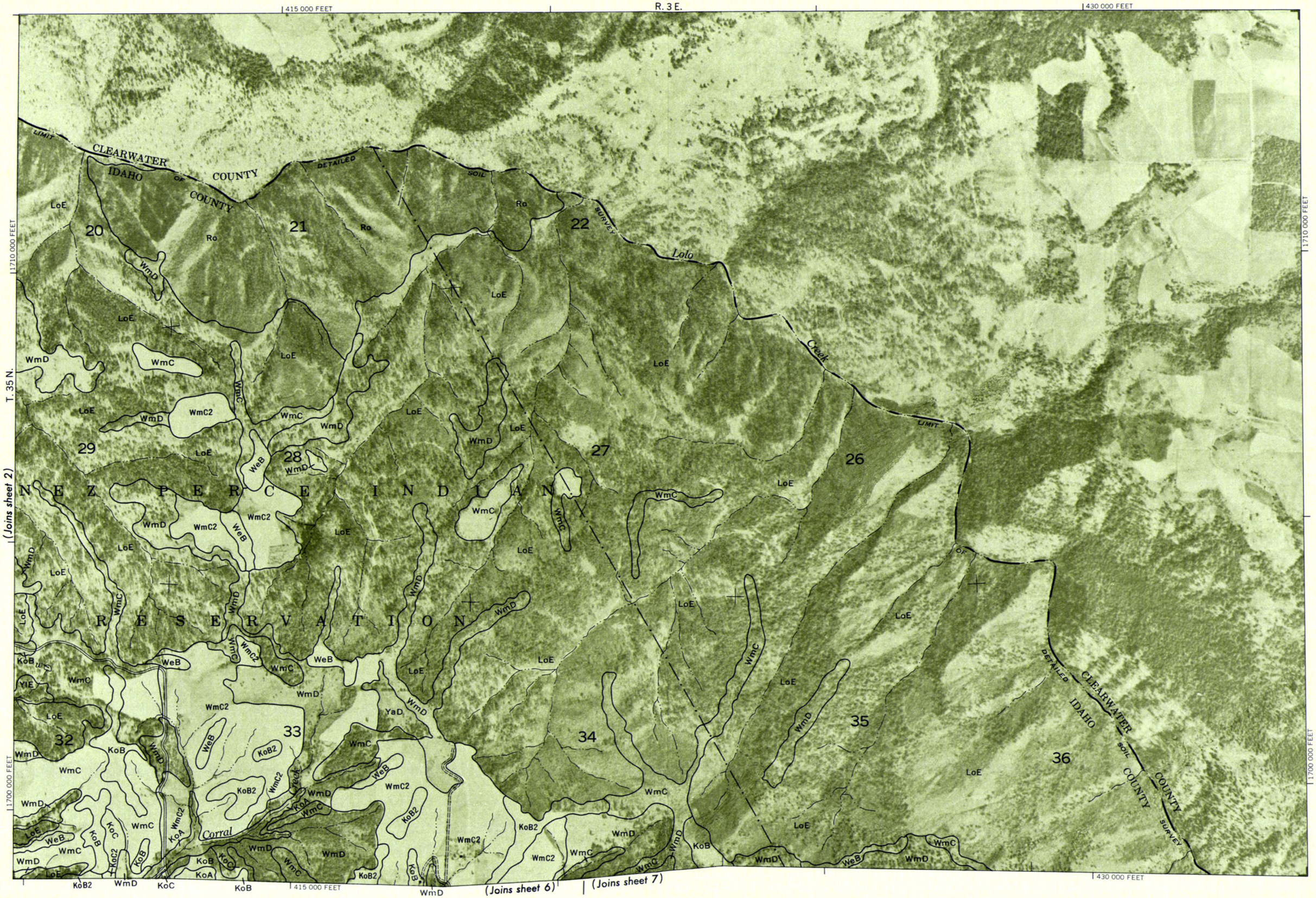
Big Tinker Cr

Creek

1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 17 18

SuE SuC LyE GcC LoE Mn NcA NcB JcC WeB MoC MoE WmD WmC CaC CaD Rk BcE KcE GmE HeC HeB

KOOSKIA AREA, IDAHO — SHEET NUMBER 3



KOOSKIA AREA, IDAHO — SHEET NUMBER 30

30

N

R. 6 E. | R. 7 E.

515 000 FEET

535 000 FEET

1630 000 FEET

1620 000 FEET

(Joins sheet 25)

(Joins sheet 29)

(Joins inset, sheet 38)

(Joins sheet 34)

T. 32 N.

1 Mile

5 000 Feet

Scale 1:20 000

0 0 1 000 ¼ 2 000 ½ 3 000 ¾ 4 000 1 5 000

C L E A R W A T E R N A T I O N A L F O R E S T

N E Z P E R C E N A T I O N A L F O R E S T

MIDDLE FORK CLEARWATER RIVER

Big Hill Rapids

Bridge Creek

Three Devils Creek

Lodge Creek

Decker Creek

SURVEY

SOIL

DETAILED

OF

LIMIT

LIMIT OF DETAILED SOIL SURVEY

Lodge Point

SuE SuC LoE LyE Mn GcC

1 2 3 5 6 7 8 10 11 12 13 14 15 17 18

KOOSKIA AREA, IDAHO — SHEET NUMBER 31

31

N

(Joins sheet 27)

R. 4 E. | R. 5 E.

T. 32 N.

(Joins sheet 32)

(Joins inset A, sheet 26)

(Joins sheet 35)

445 000 FEET

465 000 FEET

1615 000 FEET

1605 000 FEET

Scale 1:20 000

1 Mile

5 000 Feet

1 000

2 000

3 000

4 000

5 000

¼

½

¾

1

0

Clear Creek

Leitch Creek

NEZ PERCE INDIAN RESERVATION

BATTLE Ridge

SOUTH FORK CLEARWATER RIVER

Stites

Dizzy Head

Rabbit Ck.

21

22

23

24

19

25

26

27

28

30

31

33

34

35

36

13

N

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

470 000 FEET

490 000 FEET

1615 000 FEET

1605 000 FEET

(Joins sheet 28)

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 36)

R. 5 E.

T. 32 N.

THE HORN

RIDGE

TAHOE CEMETERY

Leitch Creek

Little Cedar Creek

Big Cedar Creek

Timber Creek

19 20 21 22 23 30 29 28 27 26 31 32 33 34 35

KOOSKIA AREA, IDAHO — SHEET NUMBER 33

33

N

R. 5 E. | R. 6 E.

T. 32 N.

495 000 FEET

510 000 FEET

1615 000 FEET

1605 000 FEET

(Joins sheet 29)

(Joins sheet 34)

(Joins sheet 32)

(Joins sheet 37)

N E Z P E R C E

N A T I O N A L F O R E S T

Little Tinker Creek

Big Cedar Creek

Potato Hill

Knob

Pine

Browns

Spring

Clear Creek

Clear Cr

TRAIL

PACK TRAIL

1 Mile

5 000 Feet

Scale 1:20 000

(34)

N

1 Mile 5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

515 000 FEET

(Joins sheet 30)

R. 6 E. | R. 7 E.

530 000 FEET

1615 000 FEET

(Joins sheet 33)

1605 000 FEET

520 000 FEET

(Joins sheet 38)

T. 32 N.

Lodge Creek

TRAIL

LIMIT OF DETAILED SOIL SURVEY

Pine Knob

Spring Creek

Browns Creek

PACK TRAIL

NEZ PERCE NATIONAL FOREST

19 24 23 22 25 26 27 34 35 36

SuE SuC LyE HmC BcE JuE JuD GmE HeC

3000 AND 5000-FOOT GRID TICKS

(20)

540 000 FEET

R. 7 E.

543 000 FEET

1645 000 FEET

(Joins sheet 25)

1635 000 FEET

T. 33 N.

CLEARWATER NATIONAL FOREST

21 28 33

JuE SuE LoE Mn GcC

Pete King Creek

Lowell Cr

DETAILED SOIL SURVEY LIMIT

RIVER

LOCHSA

(Joins inset, sheet 38)

KOOSKIA AREA, IDAHO — SHEET NUMBER 35

35

N

445 000 FEET

465 000 FEET

R. 4 E. | R. 5 E.

(Joins sheet 31)

1600 000 FEET

1590 000 FEET

T. 31 N.

(Joins sheet 26)

(Joins inset B, sheet 26)

(Joins sheet 36)

(Joins sheet 39)

SHORELINE LIMIT OF DETAILED SOIL SURVEY

SOUTH FORK CLEARWATER RIVER

LIMIT OF DETAILED SOIL SURVEY

NEZ PERCE INDIAN RESERVATION

Rabbit Creek

Sally Ann Creek

Clearwater

1 Mile

5 000 Feet

Scale 1:20 000


36
N
R. 5 E.
T. 31 N.
(Joins sheet 32)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 40)
470 000 FEET
490 000 FEET
1600 000 FEET
1590 000 FEET
Scale 1:20 000
1 Mile
5 000 Feet
Crane Hill
Lookout Station
NEZ PERCE NATIONAL FOREST
Cedar Creek
Big Clear Creek
Rabbit Creek
Clear Creek
South Fork Clear Creek
Lost Fork Mule Creek
West Fork Lost Mule Creek

KOOSKIA AREA, IDAHO — SHEET NUMBER 37

37

N

R. 5 E. R. 6 E.

495 000 FEET

510 000 FEET

1600 000 FEET

1590 000 FEET

T. 31 N.

(Joins sheet 33)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 41)

N E Z P E R C E

N A T I O N A L F O R E S T

Clear Creek

Middle Fork Clear Creek

South Fork Clear Creek

Solo Creek

PACK TRAIL

TRAIL

KcD KcE GmE LyE SuE SuC JuE JuD LoE BcE HmC

1 Mile

5 000 Feet

Scale 1:20 000

N

R. 6 E.

520 000 FEET

535 000 FEET

1600 000 FEET

1590 000 FEET

(Joins sheet 34)

(Joins sheet 37)

(Joins inset, sheet 34)

(Joins sheet 30)

(Joins inset, sheet 48)

1 Mile

5 000 Feet

Scale 1:20 000

0 0 ¼ 1 000 ½ 2 000 ¾ 4 000 1 5 000

N E Z P E R C E

N A T I O N A L

F O R E S T

T. 32 N.

T. 31 N.

R. 7 E.

540 000 FEET

543 000 FEET

1633 000 FEET

1630 000 FEET

CLEARWATER NATIONAL FOREST

NEZ PERCE NATL FOREST

RIVER

SELWAY

MIDDLE FORK CLEARWATER R

SHORE LIMIT OF DETAILED SOIL SURVEY

LIMIT OF DETAILED SOIL SURVEY

LOCHSA

Clear Creek

PACK TRAIL

TRAIL

SOIL SURVEY

DETAILED

LIMIT

Lookout Butte

Lookout Station

JuD

JuE

HmC

GcC

SuE

SuC

LyE

Co

3000-FOOT GRID TICKS

39

N

R. 4 E. | R. 5 E.

(Joins sheet 35)

445 000 FEET

465 000 FEET

1585 000 FEET

1575 000 FEET

T. 31 N.

CLEARWATER INDIAN RESERVATION

NEZ PERCE INDIAN RESERVATION

NEZ PERCE NATIONAL FOREST

SHORE IS LIMIT OF DETAILED SOIL SURVEY

Clearwater Cemetery

Harpster

Salty Ann Creek

Wall Creek

Sears Creek

South Fork

(Joins sheet 40)

(Joins sheet 42)

Scale 1:20 000

1 Mile

5 000 Feet

KOOSKIA AREA, IDAHO — SHEET NUMBER 4

4

N

500 000 FEET

520 000 FEET

1710 000 FEET

1700 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

LIMIT OF DETAILED SOIL SURVEY

PACK TRAIL

21 22 26 27 28 29 32 33 34 35

T. 35 N.

R. 6 E.

CLEARWATER NATIONAL FOREST

IDAHO COUNTY

CLEARWATER COUNTY

MoC JuE Co BcE HeB

White Creek

Cap Creek

Ridge

Lookout Station

Chamook Creek

Cedar Creek

Austin Ridge

Mike Creek

Utah Creek

Nevada Creek

Wanii Creek

Bois

(Joins sheet 5)

(Joins sheet 9)

(Joins sheet 10)

40

N

Scale 1:20 000

1 Mile 5 000 Feet

470 000 FEET

490 000 FEET

1585 000 FEET

1575 000 FEET

R. 5 E.

T. 31 N.

(Joins sheet 36)

(Joins sheet 39)

(Joins sheet 41)

(Joins sheet 43)

NEZ PERCE NATIONAL FOREST

Rabbit Creek

Ann Cr

Creek

Sill Creek

Creek

Wall Creek

Clear Creek

Hoodoo Creek

West Fork

19 20 21 22 23

30 29 28 27 26

31 32 33 34 35

KoA KoB KoC KoB2 KoC2 CaC JaC JaC2 PoA GmD GmE JmD YaD KcD KcE NcA BcE LoE WeB WmD WmC SuE SuC LyE JuE JuD SaE

KOOSKIA AREA, IDAHO — SHEET NUMBER 41

41

N

(Joins sheet 37)

495 000 FEET

510 000 FEET

1585 000 FEET

1575 000 FEET

R. 5 E. | R. 6 E.

T. 31 N.

(Joins sheet 40)

(Joins inset, sheet 48)

(Joins sheet 44)

N E Z P E R C E

N A T I O N A L F O R E S T

19 20 21 22

24 25 30 29 28 27

36 31 32 33 34

JuE JuD HmC LyE SuE Co

Creek Mule Lost Clear Middle Fork Kay West South Branch

TRAIL

LIMIT OF DETAILED SOIL SURVEY

1 Mile 5 000 Feet

Scale 1:20 000

1 5 000 | ¾ 4 000 | ½ 3 000 | ¼ 2 000 | 0 1 000 | 0


42
N
(Joins sheet 39)
R. 4 E.
445 000 FEET
465 000 FEET
1570 000 FEET
1560 000 FEET
T. 30 N.
SHORE IS LIMIT OF DETAILED SOIL SURVEY
LIMIT OF DETAILED SOIL SURVEY
SOUTH FORK CLEARWATER RIVER
Sears Creek
Green Creek
Green Creek Point
Lightning Creek
Little Lightning Creek
Meadow Creek
North Fork Whitman Creek
Sugarloaf
NEZ PERCE NATIONAL FOREST
1 Mile
5 000 Feet
Scale 1:20 000
(Joins inset, sheet 45)
(Joins sheet 46)
(Joins sheet 43)

KOOSKIA AREA, IDAHO — SHEET NUMBER 43

43

N

470 000 FEET

490 000 FEET

1570 000 FEET

1555 000 FEET

R. 5 E.

T. 30 N.

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 47)

Wall Point

Corral Hill

Lookout Station

N E Z P E R C E

N A T I O N A L F O R E S T

Tenmile Flat

Wall Creek

Hoodoo Creek

Meadow Creek

North Meadow Creek

Storm Creek

False Creek

Yew Creek

Alder Cr

JuE

JuD

SuC

1 Mile

5 000 Feet

Scale 1:20 000

44

N

(Joins sheet 41)

R. 5 E. | R. 6 E.

495 000 FEET

510 000 FEET

1570 000 FEET

1555 000 FEET

T. 30 N.

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

N E Z P E R C E

N A T I O N A L F O R E S T

Bald Mountain

Clear Creek

TRAIL

South Fork

Clear Ridge

Point

Brandt

China

West

China Point

Silver Creek

JuE

JuD

LIMIT OF DETAILED SOIL SURVEY

(Joins sheet 43)

(Joins sheet 48)

KOOSKIA AREA, IDAHO — SHEET NUMBER 45

4000 AND 5000-FOOT GRID TICKS

45

N

N

1 Mile
5 000 Feet
Scale 1:20 000
0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

445 000 FEET
465 000 FEET
1550 000 FEET
1540 000 FEET

R. 4 E.
T. 30 N.

(Joins sheet 42)
(Joins sheet 45)
(Joins sheet 47)

NEZ PERCE NATIONAL FOREST

21 22 23 24 25 26 27 28 33 34 35 36

Dotmey Creek
TRAIL
Lightning Creek
Whitman Creek
Orchard Creek
Meadow Creek
False Creek
North Blacktail Butte
Schwartz Ridge
Blacktail Ridge
Meadow Creek
McComas Meadows
Swede Ridge
Space Creek
Swan Creek
Covert Creek

GcC GkE GsE JuE KcD KcE LyE PrC SaE SuC SuE Co

LIMIT OF DETAILED SOIL SURVEY

KOOSKIA AREA, IDAHO — SHEET NUMBER 47

47

N

470 000 FEET

490 000 FEET

R. 5 E.

(Joins sheet 43)

1550 000 FEET

1540 000 FEET

T. 30 N.

(Joins sheet 46)

(Joins sheet 48)

N E Z P E R C E

N A T I O N A L F O R E S T

Yew Ridge

Big Burn Point

False Creek

Meadow Creek

Indian Creek

Doe Creek

Swan Creek

Space Cr

Quartz Ridge

Cougar Creek

E Fk Cougar Creek

Alder Creek

Yew Creek

SuC

GcC

JuE

JuD

LIMIT OF DETAILED SOIL SURVEY

1 Mile

5 000 Feet

Scale 1:20 000

0 0

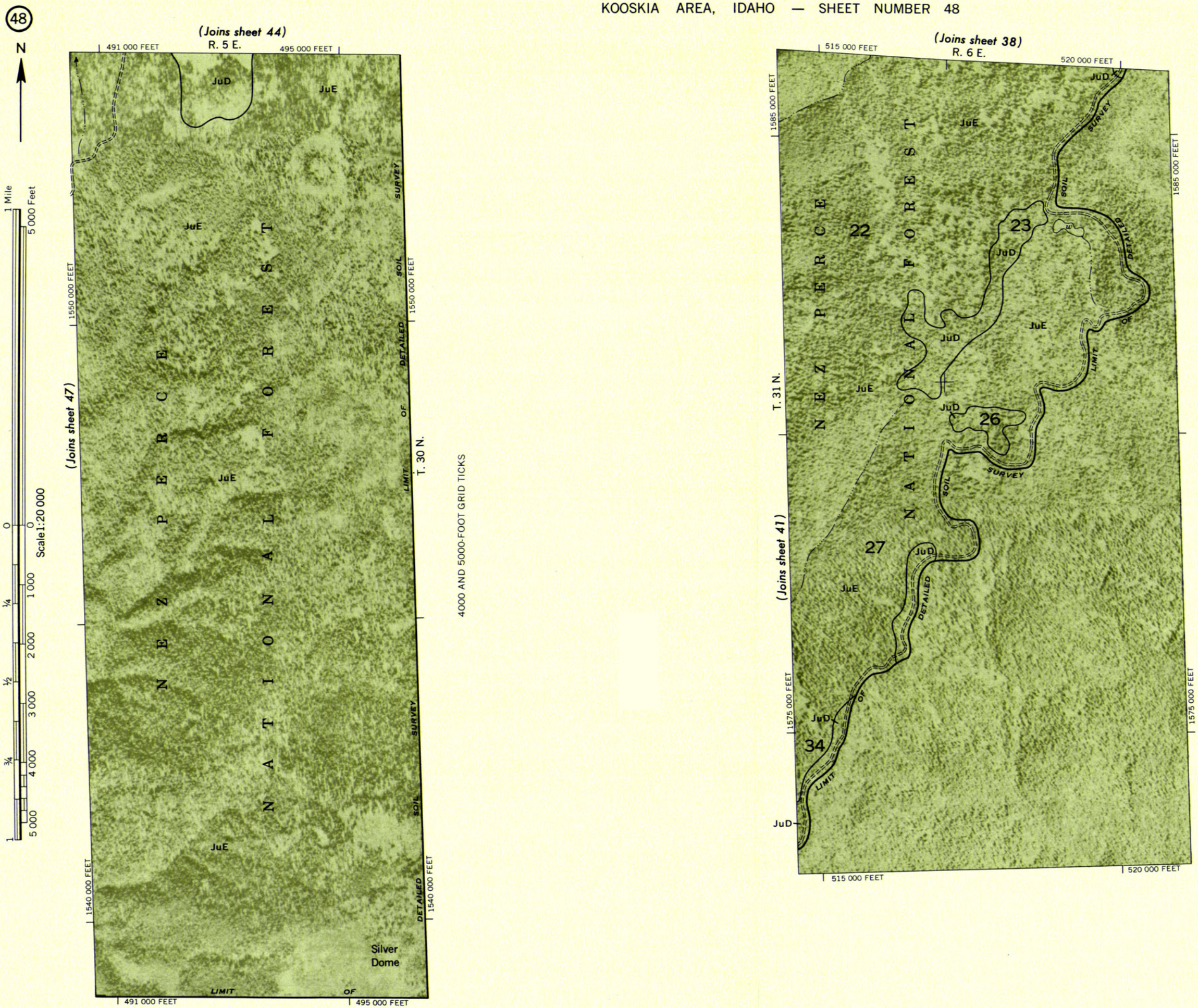
¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000


48
N
(Joins sheet 44)
R. 5 E.
491 000 FEET
495 000 FEET
515 000 FEET
520 000 FEET
(Joins sheet 38)
1585 000 FEET
1550 000 FEET
1540 000 FEET
1575 000 FEET
(Joins sheet 47)
(Joins sheet 41)
T. 30 N.
T. 31 N.
PERCE NATIONAL FOREST
JuD
JuE
SOIL SURVEY
DETAILED
LIMIT
OF
22
23
26
27
34
Silver Dome
1 Mile
5 000 Feet
Scale 1:20 000
0
¼
½
¾
1
1 000
2 000
3 000
4 000
5 000
4000 AND 5000-FOOT GRID TICKS

KOOSKIA AREA, IDAHO — SHEET NUMBER 5

5

N

(Joins sheet 1)

525 000 FEET

R. 6 E. | R. 7 E.

540 000 FEET

1710 000 FEET

T. 35 N.

(Joins sheet 4)

1700 000 FEET

(Joins sheet 10)

Ridge

SURVEY TRAIL

DETAILED SOIL PACK LIMIT OF

Austin

C L E A R W A T E R

N A T I O N A L

F O R E S T

Creek

Eldorado Creek

Six-bit Creek

LOLO SOIL SURVEY TRAIL

LOLO TRAIL LIMIT OF DETAILED

19 20 24 25 26 29 30 31 32 35 36

JuE JuD Co MoC

1 Mile

5 000 Feet

Scale 1:20 000

KOOSKIA AREA, IDAHO — SHEET NUMBER 6

6

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

400 000 FEET

420 000 FEET

1695 000 FEET

1685 000 FEET

(Joins sheet 2)

(Joins sheet 3)

R. 3 E.

T. 34 N.

(Joins sheet 7)

(Joins inset, sheet 21)

LEWIS COUNTY

IDAHO COUNTY

NORTHERN PACIFIC

UNION PACIFIC

CLEARWATER RIVER

N E Z P E R C E I N D I A N R E S E R V A T I O N

Woodland

Pardee

Corral Creek

6 5 4 3 7 8 9 10 18 17 16 15

KOOSKIA AREA, IDAHO — SHEET NUMBER 7

425 000 FEET

(Joins sheet 3)

R. 3 E. | R. 4 E.

440 000 FEET

1695 000 FEET

1685 000 FEET

T. 34 N.

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 11)

430 000 FEET

440 000 FEET

7

N

1 Mile

5 000 Feet

Scale 1:20 000

CLEARWATER COUNTY

IDAHO COUNTY

LIMIT OF DETAILED SOIL SURVEY

Lolo Creek

Hollingsworth Canyon

Wall Canyon

NEZ PERCE INDIAN RESERVATION

Woodland

PoA KoC WmC2 WeB WmC WmD KoB KoA KoB2 KoC2 JmD2 KcD KcE GmE GmD JaC2 JaB LoE Ro

8

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

1¼ 5 000

445 000 FEET

465 000 FEET

1695 000 FEET

1685 000 FEET

T. 34 N.

R. 4 E. | R. 5 E.

(Joins sheet 7)

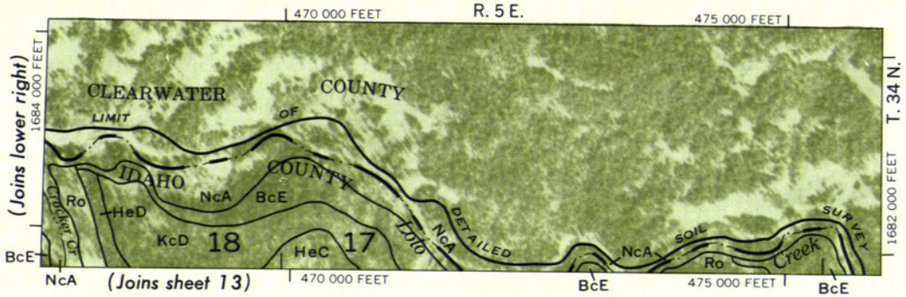
(Joins sheet 12)

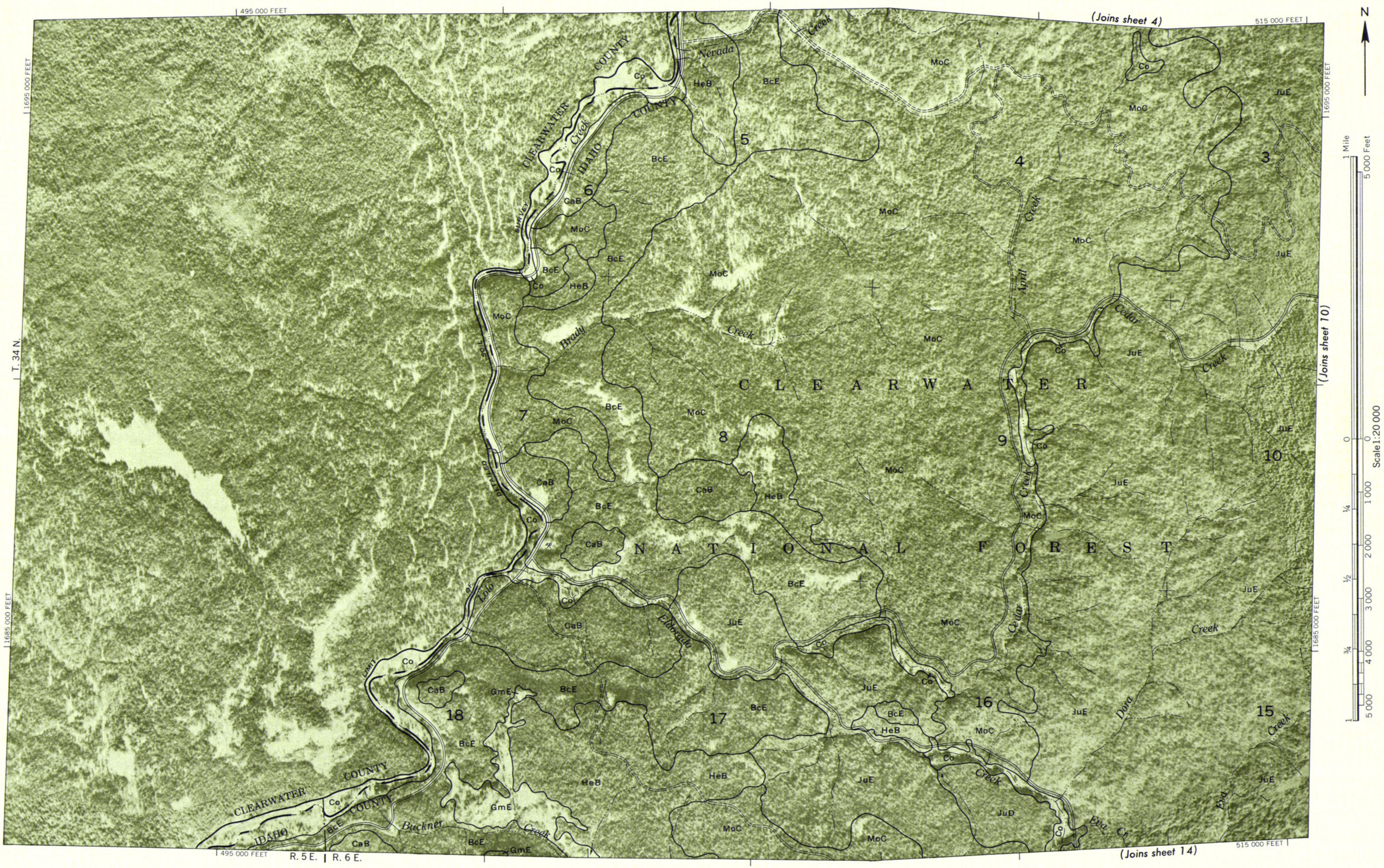
(Joins inset)

(Joins lower right)

(Joins sheet 13)

2000 AND 5000-FOOT GRID TICKS




9
N
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 14)
495 000 FEET
515 000 FEET
1695 000 FEET
1685 000 FEET
T. 34 N.
R. 5 E.
R. 6 E.
CLEARWATER NATIONAL FOREST
CLEARWATER COUNTY
IDAHO COUNTY
1 Mile
5 000 Feet
Scale 1:20 000
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000
Nevada
Creek
Brady
April
Cedar
Eldorado
Lolo
Buckner
Dora
Eva
MoC
BcE
HeB
Co
CaB
JuE
GmE
JuP
3
4
5
6
7
8
9
10
15
16
17
18